CAPACITY TO SUPPORT CUMULATIVE EFFECTS ASSESSMENT AND MANAGEMENT IN THE ATHABASCA WATERSHED, ALBERTA, CANADA

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Canada

By

JESSE STEVE SKWARUK

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ABSTRACT

It has been well articulated that there is a need to better assess and manage cumulative environmental effects on Canada's watersheds. Cumulative Effects Assessment and Management (CEAM) is simply not working in its current form. Presently there exists a significant amount of literature on the scientific aspects necessary to assess cumulative environmental effects; however, there are limitations in the understanding of the institutional arrangements relating to CEAM. Taking into account this shortcoming, the objectives of this research are to evaluate the current institutional framework by determining the presence of requisites necessary for watershed-based CEAM and to identify the capacity requirements to support the these requisites in the Athabasca watershed in Alberta. The methods applied to achieve these objectives are a focus group meeting with participants familiar with CEAM; a review of relevant documents prepared by industry, watershed groups, and government; and a series of semi-structured interviews with key stakeholders. The overall analysis will be based upon eight requisites necessary for CEAM which have been identified through a previous research study of watershed-based cumulative effects assessment and management.

The central findings of this study demonstrate that, although the institutional arrangements are in the process of being developed in the Athabasca watershed, there still exist many challenges relating to the capacity requirements to support watershed-based CEAM. The primary challenges which have been identified by those who participated in this study include the lack of effective data management and coordination, a lack of broader regional programs, and a lack of an overarching funding mechanism to support watershed-based CEAM initiatives. Despite these challenges, it was found that steps are being taken in the Athabasca watershed and province to develop frameworks which are conducive to advancing the institutional arrangements and capacity for watershed-based CEAM. This is demonstrated through the development of recent legislation mandated to provide direction for CEAM, in addition to the presence of various multi-stakeholder organizations which participate in the decision-making processes relating to watershed management. This research will contribute to a larger, Canada-wide project focused on the effective implementation of watershed-based CEAM in Canadian watersheds. Specifically, this study will contribute to the understanding of institutional arrangements and capacity requirements in the Athabasca watershed in Alberta.

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AENV	Alberta Environment
ALSA	Alberta Land Stewardship Act
CEAA	Canadian Environmental Assessment Act
CEA	Cumulative Effects Assessment
CEAM	Cumulative Effects Assessment and Management
CEMA	Cumulative Environmental Management Association
EIA	Environmental Impact Assessment
ENGO	Environmental Non-governmental Organization
EPEA	Environmental Protection and Enhancement Act
ERCB	Energy Resources Conservation Board
LARP	Lower Athabasca Regional Plan
LUF	Land-use Framework
NRCB	National Resources Conservation Board
RAMP	Regional Aquatics Monitoring Program
WBEA	Wood Buffalo Environmental Association
WPAC	Watershed Planning and Advisory Council

CHAPTER 1

INTRODUCTION

1.1 Introduction

Water quality and quantity in Canada's watersheds are under increasing stress from various activities, such as agriculture, industry and urban development (Schindler 2001). Specifically, Canada's western prairie provinces are recognized as being an area of particular vulnerability due to the combined effects of human activity and climate warming (Schindler and Donahue 2006). The Athabasca River, for example, has experienced an increase in levels of activity over the past few decades, including forestry, pulp and paper, coal mining, and oil and natural gas extraction (Squires *et al.* 2010). As demands for freshwater resources intensify it will become increasingly critical to develop policies and strategies to protect healthy ecosystems and promote human well-being (Postel 2008).

Presently, project-specific environmental impact assessments (EIAs) are used to mitigate the adverse effects of fresh water contamination. One of the major deficiencies in the current approach to watershed-based impact assessment is that project-specific analyses are limited in scale and do not generally incorporate multiple stressors over space and time (Therivel and Ross 2007; Baxter *et al*. 2001). Due to this limitation, it is necessary to consider how project specific assessments may be linked with broader regional or watershed-scale initiatives. Watershed-scale planning is needed for the management of freshwaters in the western prairie provinces, to safeguard these resources which are becoming increasingly scarce (Schindler and Donahue 2006).

Additionally, Cooper and Sheate (2004) note that individual projects and activities cannot be considered in isolation of other projects which are adversely affecting environmental resources. For this reason it is necessary to go beyond the scope of site-specific environmental impact assessment and consider the cumulative effects which adversely affect water resources.

Cumulative effects are described as effects on the environment that result from the incremental and accumulating impact of an action when added to other past, present and foreseeable actions (Hegmann *et al.* 1999). While earlier practices of identifying cumulative environmental effects had been described as *cumulative effects assessment* (CEA), current attention to management and mitigation of cumulative effects has led to the practice now being commonly referred to as *cumulative effects assessment and management* (CEAM) (Canter and Ross 2010).

Although the concept of CEAM came into existence in 1979 world over, its implications, consequences and feasibility were only given serious consideration during the mid-1990s (Ramachandra *et al*. 2006). Since 1995, CEAM in Canada has been required for all project-based environmental assessments under the Canadian Environmental Assessment Act. The *Cumulative Effects Assessment Practitioners Guide*, published in 1999*,* attempts to outline how CEAM should be practiced. In theory, CEAM is used to assess any potential effects of a proposed project relative to the assimilative capacity of the existing environment (Dubé and Munkittrick 2001). CEAM is advocated as a means to analyze the adverse effects of human activity on watersheds in a holistic manner; however, the promise and practice of CEAM are so far apart that continuing the kinds and qualities of CEAM currently undertaken in Canada

are “doing more damage than good” (Duinker and Greig 2006: 153). As such, putting CEAM into practice still remains a challenge in Canada even in recent times (Gunn and Noble 2011; Government of Canada 2009).

The current approach to CEAM does not place emphasis on the combined effects of planning developments and typically focuses on development activities on a project-by-project basis (Duinker and Greig 2006; Schindler and Donahue 2006). A form of CEAM is frequently performed at the individual project level as part of the project-based EIA (Dubé 2003); however, it is well know the project-specific scale is not well suited for CEAM as it does not take into consideration the multiple disturbances which occur on a broader scale (Spaling and Smit 1993). CEAM must expand beyond the evaluation of site-specific project impacts and envelop a broader regional understanding of the sources of cumulative environmental change (Harriman and Noble 2008; Duinker and Greig 2006; Kennett 2002).

More must be done to develop a holistic framework for the effective implementation of CEAM in Canada’s watersheds. Regional planning, for instance, has been recognized as a means to effectively accomplish CEAM, where CEAM is typically expected to assess effects over a regional area which may transverse jurisdictional boundaries (Hegmann *et al*. 1999). A regional approach could focus on an area that is ecologically meaningful, such as a watershed (Duinker and Greig 2006). Schindler and Donahue (2006) stress the need for watershed-scale planning and the management and conservation of freshwaters in the western prairie provinces, and the “need for frameworks to support regional CEA[M] has been recognized for some time in the environmental assessment literature” (Noble 2008: 78). However, CEAM has only

achieved mixed success; one reason for this is a lack of supporting institutional frameworks (Noble 2008; Schindler and Donahue 2006). Therefore, further attention must be given to the institutional arrangements required to support watershed-based CEAM.

1.2 Institutional arrangements and CEAM

Institutional arrangements refer to the processes and structures of decision-making which may include elements such as legislation, policy, political structures and key participants or stakeholders (Ivey *et al.* 2006a). Another important element of institutional arrangements includes the structure of the relationships between the various organizations which may exist in a watershed (Imperial 1999). Examples of such organizations include watershed agencies, various levels of government, public/private organizations, project proponents and First Nations. Incorporating myriad stakeholders in watershed-based projects assists in building knowledge and commitment of resource users towards sustainable resource management (Fenemor *et al.* 2008). In addition to the multi-stakeholder involvement required for effective institutional arrangements, it is also essential to have guiding legislation and policy initiatives.

Water resources are affected by a broad range of human activities and institutional arrangements, such as industrial practices, agriculture and recreation (Moss 2004). These uses and institutional arrangements must be considered when attempting to manage water resources on a watershed scale. Consideration of a wide range of institutional arrangements is an integral aspect in the advancement of CEAM (Dixon and Montz 1995; Spaling and Smit 1993).

Although much attention is given to the science required to pursue watershed-based CEAM, assessing the institutional arrangements required for effective CEAM still remains a challenge (Grzybowski and Associates 2001). For watershed-based CEAM to be pursued, attention must be given to how institutional arrangements may be advanced. In addition to the lack of effective institutional arrangements, capacity related issues are also a prominent concern in the field of water management (Patrick *et al.* 2008; de Loë and Kreutzwiser 2005; Mitchell 2005). Consequently, the capacity issues relating to institutional arrangements warrant consideration, as they are an integral part of the advancement of watershed-based CEAM.

Capacity focuses on the ability of various stakeholders to work toward a set of externally defined goals (Ivey *et al.* 2006b). Although capacity is a broad term, CEAM capacity issues may be analyzed according to financial, technical, human, scientific, legislative, legal and organizational aspects. Although all of these dimensions of capacity are important when considering CEAM, it should be recognized that capacity may often be a function of several interrelated dimensions which vary between organizations and communities (de Loë *et al.* 2002).

In addition to analyzing the various dimensions of capacity, it is also necessary to focus on how capacity may be enhanced when pursuing CEAM initiatives. Capacity building is a means of gaining technical, managerial and institutional knowledge and insight which seeks to increase the flexibility of institutions (Hamdy *et al.* 1998). Thus, it is important to consider how capacity may be enhanced when exploring the institutional arrangements related to watershed-based CEAM.

1.3 Research purpose and objectives

This thesis research is part of a larger research project to examine how CEAM may be advanced on a watershed scale in Canada. The larger research project focuses on CEAM practices and institutional arrangements in four Canadian watersheds where physical science-based CEAM research is currently ongoing. Specifically, the goal of this larger project is to evaluate the current state of institutional arrangements and capacity to effectively implement and sustain 'good' watershed-based CEAM. The four watersheds included in the larger research project are the Lower Fraser in British Columbia, the South Saskatchewan in Saskatchewan, the Grand River Basin in Ontario, and, lastly, the Athabasca watershed in Alberta, which is the focus of this specific research project. An earlier project, which began in 2009, identified the necessary institutional and capacity requirements to do 'good' watershed-based CEAM in Canada. This research had identified eight requisites for effective implementation of watershed-based CEAM (see Sheelanere 2010), namely:

- Lead agency
- Enabling legislation
- Financial and human resources
- Data management and coordination
- Multi-scaled monitoring
- CEAM baselines, indicators and thresholds
- Multi-stakeholder collaboration
- Vertical and horizontal linkages

The overall purpose of this research is to assess the potential of current institutional arrangements in the Alberta portion of the Athabasca watershed to support watershed-based CEAM. The specific objectives of this research project are:

1) To determine the presence of the requisites necessary for watershed-based CEAM; and

2) To identify the capacity requirements to support the advancement of the identified requisites for watershed-based CEAM.

1.4 Study area

The Athabasca watershed originates in the Rocky Mountains of Alberta in the Columbia Icefields. Although many rivers and streams lie within the Athabasca watershed, the most prominent river is the Athabasca River, which flows from the Rocky Mountains, wends its way northeast for more than 1538 kilometers across the province of Alberta and eventually drains into the Lake Athabasca, which lies in an area known as the Peace-Athabasca Delta (Squires et al. 2010; Peace-Athabasca Delta Project Group 1972). This area is of significant ecological value and is recognized internationally as a UNESCO World Heritage Site (Schindler *et al.* 2007). The Athabasca watershed covers 157 000 kilometers squared and accounts for approximately 22% of Alberta's landmass (Gummer *et al.* 2000). The majority of the Athabasca watershed exists within the province of Alberta; however, a portion lies in the northern part of the province of Saskatchewan. By focusing on the institutional arrangement in only the Alberta portion of the Athabasca watershed, this study was able to focus on a single provincial jurisdiction as opposed to multiple jurisdictions spanning provincial boundaries. This ultimately allowed for a more specific analysis relating to the institutional arrangements found within the Athabasca watershed relating to watershed-based CEAM.

The Athabasca watershed, in its entirety, includes a variety of ecosystems. At its headwaters in the Rocky Mountains, the watershed passes through alpine meadows and mountain forests, then passes through a grassland-boreal transitional forest area in its mid-reaches and then onward to peat lands and boreal forest of northeastern Alberta

(Keepers of the Water 2011; Keepers of the Athabasca 2008). Wetlands make up approximately 40% of the boreal forest landscape in Alberta and fulfill important ecological roles, such as habitat for rare plants and wildlife, regulation of both surface and groundwater, and as natural filters for water resources (Woynillowicz *et al.* 2005).

The largest population centers in the Athabasca watershed are Whitecourt, Hinton, and Fort McMurray, which have populations of 8971, 9738, and 47705, respectively (Statistics Canada 2006). The lower Athabasca region has witnessed significant population growth in recent times, which is largely fuelled by the rapid expansion of the oil and gas industry (Schindler and Donahue 2006). For instance, in the Municipality of Wood Buffalo the population more than doubled between 1996 and 2006 (RMWB 2006).

The Athabasca watershed provides a valuable case study for CEAM analysis due to various land uses in the region. In the upper reaches of the watershed there are three coal mines, four pulp and paper mills, one news print mill and several sawmills and panelboard factories operated by the forest industry (Timoney 2007). Additionally, approximately 12% of the watershed is agricultural land (Timoney 2007). Much of the watershed is covered by conventional oil and gas industries, in addition to oil sands industrial development (Timoney 2007). The oil sands development in the lower Athabasca region has been an important factor in the economic development of Alberta. In spite of this, it has also been a source of controversy in recent times due to the adverse environmental implications of this development.

Despite that the oil sands development has placed considerable stress on aquatic ecosystems in the region, oil sands projects continue to be approved (Schindler and Donahue 2006). Although in-stream water uses in the Athabasca watershed have been

deemed favorable from a western science perspective, concerns have been raised by aboriginal inhabitants regarding water quality in the region (Dubé *et al.* 2007). In the coming decades, nearly 10% of the regional wetlands may be modified from their natural state and removed from the landscape, largely due to oil sands operations (Woynillowicz *et al.* 2005).

Figure 1.1 Map of Athabasca Watershed in Alberta: Produced by Keith Bigelow, Geography and Planning, University of Saskatchewan.

Although the oil sand industry places major stress on the water resources in the Athabasca watershed, other principal stressors include the pulp and paper industry, municipal sewage, and agricultural and forestry activities (Wrona *et al.* 2000). As a result of the various activities in the region, forests in the watershed have been greatly fragmented by roads, power lines, pipelines and other disturbances (Schneider 2002). Unfortunately, the amount of old forest is now being reduced with no requirements in place for its maintenance (Schneider 2002). All of the above mentioned activities must be considered when analyzing how CEAM may be practiced. Due to the increasing level of land use development over the past decades, the Athabasca watershed serves as a good case study for CEAM.

1.4.1 CEAM in the Athabasca watershed

There have been three cumulative effects assessments conducted for different parts of the Athabasca watershed, which include the Northern River Basin Study, the Northern River Ecosystem Initiative and the Regional Aquatics Monitoring Program (Squires *et al.* 2010). In spite of these initiatives, a CEAM framework has not yet been developed which encompasses the entire Athabasca watershed from its headwaters to its lower reaches. However, there are initiatives, policies and multi-stakeholder groups in the province which are mandated to address watershed-based CEAM.

Currently in the Athabasca watershed, CEAM is practiced on a project-by-project basis and, as result, the cumulative effects a project may have on the broader watershed are not acknowledged as part of the environmental assessment process (Seitz *et al.* 2011). Despite this, project-based assessments of cumulative effects are required under the regulatory frameworks of either the federal government or the province of Alberta. The

Canadian federal government mandates cumulative effects assessments on projects which fall under federal authority. The federal agency responsible for overseeing the process is the Canadian Environmental Assessment Agency (CEAA) and the guiding legislation which applies to the assessment of cumulative effects is found in the *Canadian Environmental Assessment Act* under section 16(1)(a). Projects are subject to the Act if a federal authority, such as a department or agency: i) is the project proponent; ii) provides financial assistance to the proponent; iii) grants land for a project to be completed; or iv) plays a regulatory role in relation to the project, such as issuing a license or permit (CEAA 2007).

Assessment of cumulative effects under the jurisdiction of Alberta is the responsibility of Alberta Environment and is legislated according to the Alberta *Environmental Protection and Enhancement Act* (EPEA). The Act requires, in subsection 49(d), that environmental impact assessment reports include "a description of potential positive and negative environmental, social, economic and cultural impacts of the proposed activity, including cumulative, regional, temporal and spatial considerations" (Alberta Environment 2010). In addition to Alberta Environment, other government bodies play a role in the approval process, including the Energy Resources Conservation Board (ERCB) and Natural Resources Conservation Board (NRCB) (Alberta Environment 2010; Saunders 2010; Griffiths *et al*. 1998).

Cumulative effects are also addressed at a provincial level through recent environmental initiatives, such as the *Alberta Land Stewardship Act* (ALSA). The ALSA makes provisions for a single Land-use Secretariat which is responsible for supporting Cabinet decision-making, setting the terms of reference for how regional planning will be

conducted in the Province, and administering the implementation of CEAM models (Saunders 2010). Another initiative in Alberta which acknowledges the need to manage cumulative effects is the *Land-use Framework* (LUF). The LUF is "committed to managing the cumulative effects of development on air, water, land and biodiversity at the regional level" (Government of Alberta 2011: 2). The LUF agrees in principle with watershed-based CEAM as it utilizes boundaries based on watersheds, as these are regarded as the "best fit" with municipal boundaries and natural regions (Alberta Environment 2008).

Both the LUF and ALSA divide Alberta into seven regions and provide a basis for land and resource managers in those regions to take a cumulative effects approach to management activities and land-planning (Oilsands Advisory Panel 2010). The division of the province into seven regions is of particular importance to the Athabasca watershed, as the first of the land-use regional plans addressed under these initiatives is the Lower Athabasca Regional Plan (LARP). LARP is an important plan when considering CEAM in the Athabasca watershed as it uses a cumulative effects management approach to balance economic development with environmental considerations (Government of Alberta 2011).

One of the overarching initiatives to actively manage watersheds in the province is the *Water for Life Strategy*, established in 2003 by the Government of Alberta. Although the original strategy did not make provisions for CEAM specifically, the *Water for Life Action Plan* of 2009 does recognize the need for cumulative effects to be incorporated as part of a province-wide water management framework. The *Water for Life Action Plan* is the basis for integrating watershed management with Alberta's LUF and the overall

management of cumulative effects (Government of Alberta 2009). Alberta's *Water for Life Strategy* has also made important provisions for multi-stakeholder, regional watershed management groups to be established, known as *Watershed Planning and Advisory Councils* (WPACs). The Athabasca WPAC was established in 2010 as the tenth WPAC in Alberta and is the most recent council established in Alberta.

There also exist multi-stakeholder groups in the Athabasca watershed which were distinctively established to manage cumulative effects. One of theses groups is the *Cumulative Environmental Management Association* (CEMA), which was established in 2000. CEMA is a key advisor to the federal and provincial governments and provides recommendations on how to best manage cumulative environmental effects of regional development (Oilsands Advisory Panel 2010). Another stakeholder group in the watershed, which also play a key role in managing cumulative effects, is the *Regional Aquatics Monitoring Program* (RAMP), created in 1997. RAMP is an industry-funded, environmental monitoring program designed to integrate aquatic monitoring activities across different geographic locations in the Athabasca oil sands region, and monitor potential cumulative effects related to developments (Golder and Associates 1998). Organizations such as CEMA and RAMP are integral in the development of CEAM frameworks in the Athabasca watershed and are key players in providing advice and data which are needed in the assessment and management of cumulative effects.

It may be recognized that there are evident linkages between the above-mentioned agencies and institutional structures. Figure 1.2 provides a general overview of the linkages of the between the elements which are relevant for watershed-based CEAM in the Athabasca watershed under Alberta Environment.

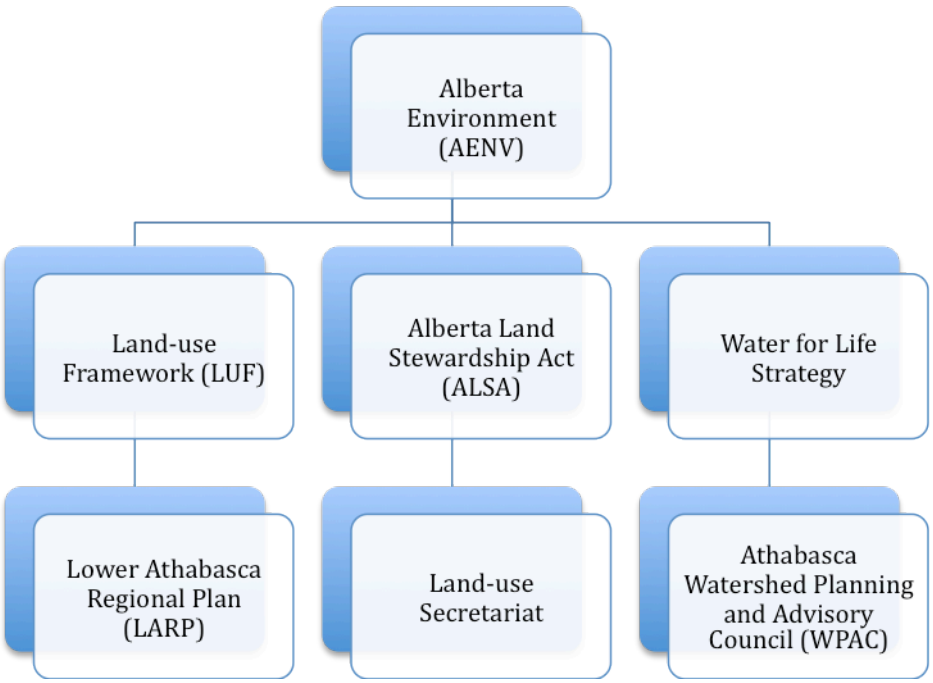

Figure 1.2 Provincial Agencies and Institutional Structures relevant for CEAM in the Athabasca watershed.

1.5 Thesis organization

This thesis is divided into six chapters. Following the introductory chapter, Chapter 2 provides a review of relevant literature relating to CEAM, institutional arrangements, and capacity building. This chapter aims to frame the overall project and give context to the research objectives described earlier. The research methods are explained in Chapter 3. Chapter 4 presents the results of this research project. A discussion of the relevance of the results within the research context is provided in Chapter 5. Conclusions and suggestions for further research are presented in Chapter 6.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Although the concept of cumulative effects assessment and management (CEAM) has existed for several decades (see Canter and Ross 2010; Ramachandra *et al*. 2006), there is now a need to examine CEAM from the perspective of institutional arrangements and capacity building (Hegmann and Yarranton 2011). Presently there exists literature focusing specifically on CEAM, institutional arrangements, and capacity as individual entities; however, there is a lack of a literature bridging these three topics. A possible reason for this is that the need to investigate the institutional arrangements required for watershed-based CEAM has only recently been acknowledged (see Hegmann and Yarranton 2011). It is necessary to consider the relevant institutional arrangements needed to advance watershed-based CEAM and the accompanying capacity requirements. For this reason, this literature review will attempt to review, as best as possible, the existing literature on these three topics with the research objectives in mind.

2.2 Cumulative Effects Assessment and Management

Cumulative effects are described as an effect on the environment that results from the incremental, additive, and synergistic impact of an action when added to other past, present and foreseeable actions (Noble 2006; Hegmann *et al.* 1999). Cumulative effects may also be characterized as environmental change resulting from ubiquitous human activities, which may individually be insignificant but when repeated over time and space may accumulate and contribute significantly to environmental change (Spaling and Smit

1993). The term ‘cumulative effects’ was first referred to in the 1973 guidelines of the Council on Environmental Quality (CEQ) in the USA (Canter and Ross 2010). During this time it was realized that proposed projects needed to incorporate their location and surrounding land uses into their environmental analysis (Canter and Ross 2010).

CEAM is used to evaluate any potential effects of a proposed project relative to the assimilative capacity of the existing environment (Dubé and Munkittrick 2001). CEAM is identified as a method used to analyze the adverse, cumulative, and environmental effects of human activity in a holistic manner (Hegmann and Yarranton 2011). CEAM deviates from traditional approaches to environmental assessment, which have mainly focused on predictions based on the effects of single project activities over a short period of time and on a limited scale (Spaling and Smit 1993). Although assessments based on individual projects are beneficial in the reduction of environmental impacts, they lack a methodological approach to assess the effects associated with multiple projects over space and time (Dubé and Munkittrick 2001). It is for this reason that the cumulative effects of all activities should be considered when attempting to analyze an area subject to various environmental stresses.

Although CEAM existed in the 1970s, it was not until the mid-1990s that its implications, consequences and feasibility were given serious attention (Ramachandra *et al*. 2006). Considerations regarding the assessment of cumulative effects in Canada are part of the Environmental Impact Assessment (EIA) process and, as Duinker (1994) points out, the assessment of cumulative effects is simply EIA done right. However, in practice, it is only after the initial recognition of effects has been identified in an EIA that an assessment of cumulative impacts is then completed (Hegmann *et al.* 1999). Since

1995, CEA has been required in Canada for all project-based environmental assessments under the *Canadian Environmental Assessment Act*. The Act states:

> **"**Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of […] any cumulative environmental effects that are likely to result from the project in combination with other projects or activities" (Government of Canada 1992, section 16[1][a]).

In addition, the *Cumulative Effects Assessment Practitioners Guide* (see Hegmann *et al*. 1999) attempts to outline how CEA should be practiced in Canada. Since the mid-1990s a great deal of attention has been given to CEA and, more recently, CEAM, demonstrating that it has possibly been the single most discussed issue in environmental assessment in recent years (Duinker and Greig 2006).

2.2.1 Watershed-based CEAM

When pursuing CEAM it is important to consider the spatial scale under which the analysis is occurring. Natural boundaries, such as watersheds, may be the most appropriate unit of analysis for CEAM, as they reflect the components of a natural system (Noble 2006). Many current approaches to water management have focused on watersheds as an analytical unit and have turned away from the confines of arbitrary political boundaries (Sabatier *et al.* 2005). Watersheds are commonly recognized in water management literature as being the most relevant unit for analysis of adverse environmental effects. The reason for this is that many land-based activities influence water quality and flow (Mitchell 2005). Analyzing cumulative effects based on a watershed-scale is important because "it identifies an approach to impact evaluation and mitigation that recognizes multiple influences" (Reid 1993: vii). For this reason, a watershed-scale approach to CEAM is most appropriate for the Athabasca watershed

due to the many developmental activities occurring in the watershed which may adversely be affecting water resources. Attempts have been made in Canada to assess cumulative effects based on a watershed scale. Examples include the Banff Bow Valley Study (see BBVS 1996) and the Northern River Basin Study (see NRBS 1996). Although CEAM may be most effectively pursued on a watershed-scale, it should be recognized that there presently exist many challenges when attempting to analyze cumulative effects.

2.2.2 General challenges for CEAM

Although there exists much literature which defines CEAM and discusses how it may be practiced, there are still many challenges in effectively assessing cumulative effects (Hegmann and Yarranton 2011; Canter and Ross 2010; Duinker and Grieg 2006; Dubé 2003; Baxter *et al*. 2001). It has been well articulated that the need to better assess and manage cumulative environmental effects on Canada's watersheds is necessary and that CEAM is simply not working in its current form (Canter and Ross 2010; Harriman and Noble 2008; Duinker and Greig 2006; Dubé 2003). One reason for this is that CEAM literature often lacks clarity and may seem needlessly complex due to the lack of common language used in different programs (Cormier and Suter 2008).

The lack of commonality in CEAM literature can be frustrating for stakeholders attempting to gain an understanding of how to assess cumulative effects on a watershed scale (Seitz *et al.* 2011). In spite of the existing literature which attempts to aid people in understanding cumulative effects, issues relating to the distinction between EIA and CEAM are still unclear to most EIA practitioners (Duinker and Greig 2006; Baxter *et al*. 2001). Likewise, it has been noted that "communities may be unable to express concern

about cumulative effects because the terms and concepts of CEA[M] remain widely unknown" (Baxter *et al*. 2001: 261). Although CEAM is widely acknowledged, there lacks a single conceptual approach or set of guiding principles which may be accepted by those involved in the practice of CEAM (Squires *et al.* 2010). One approach that may assist in bringing transparency to CEAM is the development of a common CEAM framework (Cormier and Suter 2008; Dubé and Munkittrick 2001). Baxter *et al*. (2001) suggest that clarity may also be brought to CEAM through education at all levels by collaboration between the *Canadian Environmental Assessment Agency* (CEAA) and other stakeholders, such as universities, community groups and government departments.

Determining appropriate geographic boundaries is another important element of CEAM, which poses a challenge. Geographic boundaries should be established based on a spatial scale which incorporates the processes responsible for the sources of environmental stress (MacDonald 2000). A cautious approach should be taken when considering how CEAM boundaries are to be set. For instance, boundaries which are based on the cumulative effects of a specific project may not be appropriate to incorporate the information needed for assessing the greater cumulative effects in an area (Baxter *et al.* 2001). Thus, establishing the spatial scale boundaries for CEAM is a crucial element in the effective management of cumulative effects (Noble 2006; MacDonald, 2000)

Another challenge to CEAM is a lack of consistency in the reasons as to why this type of assessment is being conducted. In theory, environmental assessment is conducted to ensure that the environment is protected; however, in practice, it is often about proponents obtaining project approval (Duinker and Greig 2006). Unfortunately, CEAM

often operates in a manner that meets the needs of those seeking project approval, instead of assessing cumulative effects (Seitz *et al.* 2011). This draws attention to the need for CEAM initiatives to be established to promote environmental integrity and to be supported by both regulators and proponents. Piper (2000) highlights the need for a framework which ensures environmental quality is maintained, and satisfies both developers and other stakeholders, such as the public and environmental non-governmental organizations.

Additionally, CEAM may not be sufficiently emphasized or funded, as key decision-makers in government agencies or the private sector may not be committed to 'good' CEAM practices (Canter and Ross 2010). Such challenges may be the result of a combination of inadequate institutional policies and uncertain science, in addition to the lack of collaboration between stakeholders (Canter and Ross 2010). In order to overcome such challenges, CEAM must advance toward including clear and common goals which are recognized by the various stakeholders involved. Incorporating multiple stakeholders in decision-making processes is important for CEAM, as the assessment of cumulative effects requires cumulative management solutions (Canter and Ross 2010; Therivel and Ross 2007).

Although there has been an increase in multi-stakeholder initiatives, there remain challenges for successful multi-stakeholder collaboration regarding CEAM. For instance, "Although stakeholder groups are becoming more commonly involved in resource management processes in western Canada, they often have limited influence over EIA follow-up including long-term monitoring programs that determine effectiveness of mitigation" (Lawe *et al*. 2005: 206). Different sets of variables could also impact

collaborative management efforts in watershed communities, such as the levels of human capital (eg. income, education) and social capital (eg. trust, networks, norms of reciprocity) (Hardy and Koontz 2010; Margerum 2002). Thus, attempting to achieve effective collaboration among various stakeholders (such as project proponents, regulatory agencies and other groups) is an ongoing challenge for effective implementation of CEAM (Canter and Ross 2010).

If significant cumulative effects are projected on any valued ecosystem component or its indicators, multi-stakeholder collaboration should be considered to develop common CEAM approaches (Canter and Ross 2010). Multi-stakeholder collaboration may also assist in the collection and organization of the information required for CEAM. However, the provision of timely and relevant scientific information is often difficult to achieve in natural resource management due to scientific information being highly fragmented across stakeholder groups (Allen and Kilvington 2005).

Another challenge to the effective implementation of CEAM are data. The management and assessment of cumulative effects requires a substantial amount of data which span broadly over temporal and spatial scales (Squires *et al.* 2010). Various types of data are needed for CEAM, such as water quality and quantity, contaminant levels, in-stream water uses, and aquatic species and habitat information (Mackenzie River Basin Board 2004). Ideally, data collected for CEAM would come from numerous stakeholders, including project proponents, government and non-governmental agencies and the scientific community. However, CEAM may be inhibited by the lack consistency and limited access to data due to fragmentation between stakeholders (Dubè 2003). An additional factor which may limit data collection is the willingness of stakeholders, such

as proponents, to share data and/or collaborate in data collection (Therivel 2004). In spite of this, if project proponents collect information using a scientific process, then information which is collected may assist in building regional databases (Dubè and Munkittrick 2001).

The need for improved scientific knowledge of complex ecosystems is another challenge to CEAM (Canter and Ross 2010). The information provided by the scientific community concerning CEAM must be reliable or it may be disregarded (Hegmann and Yarranton 2011). One of the key roles of science in CEAM is ensuring that monitoring of ecosystem parameters is undertaken in an effective manner. Monitoring is an important element of CEAM as it provides a measurement of change in human activities and environmental components (Baxter *et al.* 2001; Smit and Spaling 1995). Although monitoring is an integral element of watershed-based CEAM, it is critical that monitoring programs be improved to ensure that data are collected in a consistent manner to facilitate broad scale assessment (Squires *et al.* 2010). Without formal commitments to monitoring, CEAM may be limited by uncertainty and the overall quality of assessment may be compromised (Baxter *et al.* 2001). Other challenges which may exist with regards to CEAM monitoring, include inadequate community involvement in designing follow-up monitoring initiatives, and the lack of integrating scientific and traditional knowledge (Lawe *et al.* 2005).

A final challenge to CEAM is the identification of appropriate benchmarks for environmental quality parameters (Piper 2000). However, in order to develop benchmarks, the thresholds of environmental parameters must be understood to ensure ecosystem health is protected. Although determining thresholds is necessary, a major

problem is that they are difficult, and sometimes impossible, to establish (Duinker and Greig 2006). Furthermore, determining thresholds for CEAM also requires a reliable source of data which spans spatial and temporal scales. Hegmann *et al.* (1999) note that perhaps the greatest challenge for CEAM will be the establishment of a regional database to aid in the identification of thresholds associated with land uses and biophysical parameters.

2.2.3 Regional CEAM

More must be done to develop regional frameworks to advance CEAM practice in Canada's watersheds. One of the main objectives of pursuing a regional approach to CEAM is to develop a broader understanding of the current state of the environment and how it is affected by cumulative processes (Cocklin *et al.* 1992). Kennett (1999) similarly argues that cumulative effects management should be based on a regional perspective as opposed to a project-specific focus. Regional assessment of cumulative effects goes beyond project specific assessment and focuses on a broader range of impacts resulting from multiple project developments (Noble 2003). As such, regional approaches have the potential to overcome the limitations which are often associated with assessment at the individual project level (Harriman and Noble 2008; Noble 2003). Additionally, a regional approach for CEAM could focus on an area that is ecologically meaningful, such as a watershed (Duinker and Greig 2006) and improve data management and coordination which are often hampered by jurisdictional fragmentation (Dubè 2003).

The adoption of a more regional approach to CEAM provides an opportunity for a wider range of stakes and roles to be integrated into the decision-making and overall CEAM process (Canter and Ross 2010; João 2007; Cooper and Sheate 2004; Creasy

2002). In addition, regional frameworks may provide a way for government agencies to collaborate with various stakeholders on cumulative effects management (Braat 2002). The assessment of cumulative effects for individual projects may also benefit from a regional framework, as individual proponents would be relieved of developing their own conceptual framework for assessing cumulative effects (CEAA 2000). A regional approach to CEAM may also facilitate cost effective strategies for promoting sustainability and mitigating cumulative effects (Canter and Ross 2010). In general, it has been pointed out that a regional approach is a means of ensuring that assessment is aligned with society's desired outcomes (Grzybowski and Associates 2001) and could lead to more transparency in results than if undertaken as part of an individual assessment (CEAA 2000).

The recognition of regional planning as a means to effectively accomplish CEAM is also mentioned in the *Cumulative Effects Assessment Practitioners Guide*, where CEAM is typically expected to "assess effects over a larger (i.e., "regional") area that may cross jurisdictional boundaries" (Hegmann *et al*. 1999: 3). In spite of the recognition that CEAM be considered on a regional scale, it was not until 2003 that the Canada amended the Canadian Environmental Assessment Act to include regional studies in the assessment of cumulative effects. The amendment to the Act states:

> "The results of a study of the environmental effects of possible future projects in a region, in which a federal authority participates […] may be taken into account in conducting an environmental assessment of a project in the region, particularly in considering any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out" (Government of Canada 2003: section 16[2]).

Regional planning has also been acknowledged as a means to achieve effective CEAM has also been recognized at the provincial scale. The Government of Alberta, for instance, has begun to focus on regional planning in environmental assessment in the province through the *Alberta Land Stewardship Act* (ALSA). In addition to taking regional planning into consideration, the Act also aims to "create legislation and policy that enable sustainable development by taking account of and responding to the cumulative effect of human endeavor and other events" (Province of Alberta 2009: 5).

Although regional approaches are identified as means for advancing CEAM, the implementation of this approach has been laden with challenges (Noble 2003). For example, developing and maintaining regional frameworks requires financing over extended time periods and the negotiation of appropriate funding and cost sharing agreements (CEAA 2000). This may be a formidable challenge, as cost-sharing negotiations may be difficult to arrange due to variance in perceptions of who is responsible for undertaking a regional framework (CEAA 2000). Also, possible uncertainty over which proponents would be operating in a region in the future poses a challenge to the development of a regional framework for CEAM (CEAA 2000). Another challenge is that CEAM in Canada is not designed to fit within broader regional or environmental management frameworks in Canada (Noble 2003). In spite of these challenges, there is promise for the development of more holistic, regionally-based CEAM frameworks in Canada.

2.3 Institutional arrangements

Institutions are commonly referred to as the "rules of the game" or, more formally, as the humanly devised constraints that shape interactions between humans (North 1990).

Institutional arrangements refer to the structure of the relationships between the institutions (eg. watershed agencies, different levels of government, public/private organizations, project proponents) that are involved in meeting some type of common challenge (Imperial 1999). Additionally, institutional arrangements refer to the processes and structures of decision-making and include various elements such as legislation, policy, political structures and key participants or stakeholders (Ivey *et al.* 2006a). Institutional arrangements affect a community's or an organization's capacity to adapt to hydrological variability through the defining and identifying of the responsibilities and roles of key actors in water management (Ivey *et al.* 2004). Factors affecting institutional arrangements, with regards to water management, include legal authority, social and political support, knowledge, and resources (Ivey *et al.* 2006a). These factors are also important to consider when analyzing watershed-based CEAM.

One of the prevailing themes in the field of natural resource management is improving institutional performance (Imperial 1999). The consideration of institutional arrangements has also become a widespread theme in the field of watershed management. Lessons learned from the past indicate that water management must be based on much sounder policies and institutional arrangements which are more effective than those currently in place (Hamdy *et al.* 1998). The history of Canadian water management suggests that if a problem exists, institutional innovations, improved policy and legislation, and better planning are viewed as frequent solutions (Shrubsole 1990). The development of new legislation is one means of achieving institutional adaptation in the implementation of water management strategies (Cortner and Moote 1994). These types of solutions are not unique to Canada, however, and have been recognized internationally

as a means to improve water management for many years. International conferences have called for a new approach to the assessment, development, and management of freshwater resources, by highlighting a number of principles, including the need for institutional arrangements to be adjusted to allow stakeholder participation in all aspects of policy formulation (ICWE 1992; UN 1992). The management of watersheds should be viewed as an effort to build, manage, and maintain inter-organizational networks (Imperial and Hennessey 2000). Institutional arrangements for developing and managing water resources are essential in realizing policy goals and field-level performance (Hamdy *et al.* 1998).

2.3.1 Institutional arrangements and CEAM

The establishment of institutional arrangements necessary for managing water resources has been a continuous challenge for policy makers and planners and can be a complicated and time-consuming task (Shrubsole 1992). A lack of appropriate institutional support for CEAM may result in even the most effective one-off cumulative assessments being of little value to support broader regional decision-making and future impact assessments (Noble 2008). It is argued that decision-making frameworks are the fundamental guide toward developing effective institutional arrangements (Lane and Stephenson 2000); however, they are a neglected aspect of CEAM, which has contributed to poor CEAM practice (Hegmann and Yarranton 2011). In addition to decision-making frameworks, it is also important to consider the role of policy and how it relates to institutional arrangements. Prevailing institutional arrangements play a significant role in determining the efficacy of a given set of policies (Barrett *et al.* 2004). Significant institutional arrangements include policies and plans created by actors at the local and provincial

scales which may then create an institutional environment that guides the activities of community members, organizations, and multiple levels of government (Timmer *et al*. 2007; de Loë *et al.* 2002; Hamdy *et al.* 1998). Institutionally rich environments have been noted as a means to improve the prospects for the resolution of complex problems through the encouragement of innovation and the exploration of different ideas (Imperial 1999).

If effective institutional arrangements are to be created, it is essential to include key stakeholders in the deliberative processes that are at the center of these institutions (Sabatier *et al.* 2005; Borre *et al.* 2001; Imperial 1999; Hamdy *et al.* 1998). Thoughtful evaluation of the effectiveness of different collaborative processes through the inclusion of various stakeholders (eg. government and non-government entities, landowners, and concerned citizens) is essential to understanding what may be expected of such processes and how they can be integrated with existing institutions (Conley and Moote 2003). Also, the incorporation of various stakeholders in decision-making has resulted in a shift away from managing individual resources toward the broader perspective of ecosystem management (Imperial 1999). However, in structures involving institutions and actors where asymmetry exists in power distribution and where there are contrasting perceptions, local stakeholders may continue to find it difficult to have their interests recognized alongside the interests of other stakeholders (Adger *et al.* 2003). Additionally, changing responsibilities, priorities, and altering the capacity for action will often require institutional changes which may create political conflicts (Imperial 1999).

The "project-by-project, department-by-department and region-by-region approach no longer adequately addresses water issues and provokes several problems

confronting governments in the management of their water resources" (Hamdy *et al*. 1998: 129). Hence, it is necessary to look for solutions which may be generally applied to the management of water resources which incorporate various stakeholders. Water resource management based on citizen and stakeholder involvement and cooperation among multiple jurisdictions and disciplines is needed in order to enhance institutional arrangements (Borre *et al*. 2001) and requires the integration of public sector institutions with those at a local level (Hamdy *et al*. 1998). Institutional arrangements, such as watershed organizations, need to be developed to promote water-related agencies to coordinate and establish mutually agreed priorities (Hamdy *et al.* 1998). However, the diverse forms of watershed partnerships commonly change as time passes and the path of change can result in highly varied watershed management institutional arrangements (Genskow and Born 2006). In order to overcome such barriers, there is a need for adequately trained professionals in water resource management who can work in multi-sectorial environments (Hamdy *et al.* 1998).

In order to have effective institutional arrangements there is also a need to have a lead agency to guide the overall practice of CEAM. It is suggested that watershed-based CEAM must be lead by governments when determining objectives and thresholds founded upon sound science (Seitz *et al.* 2011; Kennett 1999; Griffiths *et al.* 1998). In addition, it has been noted that the presence of a lead agency is crucial for the coordination and communication of the information that may be necessary for the assessment of regional cumulative effects (Parker and Cocklin 1993).

Although focusing on institutional arrangements is a worthwhile task in the management of watersheds, challenges exist when considering how institutions are

designed. For example, the proper coordination of management activities, inadequate public awareness, and institutional fragmentation may constrain the regional implementation of freshwater objectives (Rast 1999). Unless institutional arrangements have the capacity to respond to their dynamic environments, institutional performance is likely to suffer (Imperial 1999; Ostrom *et al.* 1993).

2.4 Capacity building

Capacity focuses on the ability of individuals, organizations, communities and governments to work toward a set of externally defined goals (Ivey *et al.* 2006b). It is commonly recognized that capacity is a function of several interrelated dimensions, and that the relative importance of these dimensions varies from organization to organization, and from community to community (de Loë *et al.* 2002). According to the United States Environmental Protection Agency (USEPA) (1998), capacity may be evaluated according to three key features, including technical, managerial and financial components. Capacity relating to water resource management may also be assessed according to political, institutional and social factors (de Loë and Kreutzwiser 2005). Additionally, Ivey (2006b) notes that legal authority, public involvement, and the integration of land use planning and management are also core elements of capacity. Concerns regarding capacity have been an important part of the discourse of water management since the early 1990s (de Loë and Kreutzwiser 2005). In order to understand how various forms of capacity may be augmented relating to water management, it is necessary to consider the concept of capacity building.

Capacity building is the process of gaining technical, managerial and institutional knowledge and insight which aims to increase the flexibility of institutions and society to

adapt to changing circumstances (Hamdy *et al.* 1998). Capacity building is an essential requirement for efficient water resource management and includes the strengthening of institutions and managerial systems (Biswas 1996). The Delft Declaration identifies three elements of capacity building: creating an enabling environment with appropriate policy and legal frameworks; institutional development, including community participation and human resources development; and strengthening of managerial systems (IHE/UNDP 1991). Capacity building through the incorporation of various stakeholders in decision-making is noted as being part of the broader tendency of environmental management (Agrawal and Gibson 1999; Soelter and Miller 1999). Good leadership and communication between different stakeholders are also essential requirements for good capacity building (de Loë and Kreutzwiser 2005; Biswas 1996).

Institutional capacity is a key issue which should be considered in the development of an institutional framework for watershed-based CEAM. The problems created by inefficient institutional capacity building are aggravated by the problems related to water scarcity and water quality in many regions (Hamdy *et al.* 1998). Additionally, focusing on institutional capacity is necessary because institutional factors constitute the main barriers relating to the improvement of water resources management (Watson 1996). Capacity building from the institutional perspective is also noted as being complicated by the complexities which exist in intergovernmental systems, such as the presence of vertical and horizontal linkages between units of government (Gargan 1981).

Although capacity building is essential to effective watershed management, it must be approached with caution, as there are barriers which must be considered. A significant barrier to community capacity, for instance, is the lack of communication and

coordination among government agencies (Timmer *et al.* 2007; Day and Litke 1998). Communication with the public and capacity building are related to the quality of the participants' understanding of the problems they are faced with and their ability to participate (Özerol and Newig 2008). Also, capacity building for stakeholders can be helpful in preventing barriers which exist in relation to the lack of knowledge about environmental assessment (Özerol and Newig 2008). Formal capacity constraints regarding technical knowledge and legal authority may also be overcome by developing formal mechanisms for the integration of land and water uses on a watershed-scale (Ivey 2006b).

For municipalities seeking to enhance their capacity for groundwater protection (or any aspect of environmental management), strengthening relationships and building partnerships are crucial (de Loë *et al.* 2002). Efforts to develop capacity must recognize local circumstances and conditions and cannot rely upon one-size-fits-all solutions as an appropriate means to building capacity (Ivey *et al.* 2002). Furthermore, capacity building should be an ongoing process which clearly identifies both short and long-term goals that are periodically evaluated (Biswas 1996). In summary, the capacity issues relating to the institutional arrangements relevant to watershed-based CEAM must be considered when attempting to advance the assessment and management of cumulative effects in the Athabasca watershed in Alberta.

2.5 Overall observations and research gaps

It has been well articulated that the assessment of cumulative effects needs to be improved, as it is simply not functioning in its current form (Harriman and Noble, 2008; Duinker and Greig 2006; Dubé 2003). It has also been noted that CEAM must focus on

broader regional objectives and go beyond the analysis of project specific impacts (Harriman and Noble 2008; Duinker and Greig 2006); the current practice of CEAM has been shortsighted when attempting to analyze cumulative effects on a broader watershed scale. To achieve efficacy in watershed-based CEAM it is important that consideration be given to both scientific and institutional needs.

The literature on CEAM demonstrates that there are limitations in the understanding of the institutional arrangements and the capacity requirements needed to advance watershed-based CEAM (Canter and Ross 2010; Noble 2009: IAIA 2008; Imperial 1999; Dixon and Montz 1995). The majority of literature focuses on the technical and scientific knowledge needed to implement CEAM, but mentions little about the institutional arrangements and planning approaches to support CEAM. This research aims to assess the current institutional arrangements required to support watershed-based CEAM and identify the related capacity needs in the Athabasca watershed in Alberta.

CHAPTER 3

RESEARCH METHODS

3.1 Data collection

Qualitative research is a means for understanding and exploring how individuals or groups ascribe to a social or human problem (Creswell 2009). Since this research project focuses on the opinions and perceptions of those interviewed, qualitative methods were most appropriate. This project used three key methods to collect information: a review of relevant academic literature and other documents, a preliminary consultation with stakeholders through a focus group meeting, and semi-structured interviews.

3.1.1 Document review

A document review is a broad term that refers to the analysis and interpretation of data which are derived from the assessment of documents pertaining to a specific topic (Schwandt 2007). A review of pertinent documents has been noted as being beneficial to the overall research process as it assists the researcher in developing a more robust overview of the topic being researched (Shank 2006). Additionally, document analysis may also illuminate the meanings of the perceptions of organizations and also may bring insight into the understanding of organizational behavior (Forester 1994).

The document analysis in this thesis research was used to gather information relating to the existing framework of CEAM in the Athabasca watershed and, also, to gain a better understanding of how the institutions relating to CEAM presently exist. A search for documents relating to CEAM was conducted, including plans and strategies, provincial and federal Acts, and current policies and regulations which are used to guide

the CEAM processes in the Athabasca watershed. Many of the documents reviewed were accessed through online databases managed by government (eg. Government of Alberta, Government of Canada) or non-government (eg. CEMA, RAMP, Pembina Institute) organizations. Examples of documents which were reviewed include the *Canadian Environment Assessment Act*, the *Alberta Environmental Protection and Enhancement Act*, the *Alberta Land Stewardship Act* and the *Land-use Framework,* the *Water For Life Strategy,* the *Northern River Basin Study* and various environmental reports and plans which focus on the Athabasca watershed and CEAM, such as the *Lower Athabasca Regional Plan.* The document review had contributed to the development of a broad understanding of the institutional arrangements and related capacity issues for CEAM which currently exist in the Athabasca watershed in Alberta. Overall, the document review assisted in setting the context for the focus group meeting and semi-structured interviews, which were the next methodological phases of the project.

3.1.2 Focus group meeting

The basic format of a focus group is the assembly of a set of individuals selected by researchers to discuss and comment on the topic which is the subject of research (Carey and Smith 1994). Focus groups have been pointed out as being a useful method, as they provide social scientists with a means to gain insight into a range of views held by individuals regarding a specific issue (Conradson 2005). In addition, focus groups may be used to obtain opinions from a group of people interacting in a natural setting, opposed to the rather artificial setting of one-on-one interview sessions (Flowerdew and Martin 2005). In the case of this research, the key subject discussed in the focus group was CEAM in the Athabasca watershed.

A focus group meeting was held in Edmonton (June 01, 2010) with seven participants with the purpose of validating the applicability of the eight requisites. Key participants were identified for the focus group based on a pre-determined list of individuals known to be familiar with CEAM. The focus group meeting was approximately two hours in length and was used as a means to confirm whether the previously identified eight requisites for watershed-based CEAM (see Sheelanere 2010) were applicable specifically to the Athabasca watershed. The meeting also provided an opportunity for participants to express concerns regarding the requisites. Overall, the focus group assisted in confirming that, indeed, the requisites were applicable to the watershed and were a valid means by which to analyze CEAM in the Athabasca watershed in Alberta. With this confirmation, the process of scheduling a series of semi-structured interviews proceeded.

3.1.3 Semi-structured interviews

The semi-structured interview has a purpose of obtaining descriptions of the life world of the interviewee in order to interpret the meaning of described phenomena (Kvale and Brinkmann 2009). Additionally, semi-structured interviews are an effective means for collecting data in qualitative research, as they allow for flexibility in participant responses (Bryman 2004; Chadwick *et al.* 1984).

3.1.3.1 Interview participant selection

Due to the extensive nature of CEAM, it was necessary to select interview participants of myriad backgrounds. Six groups of respondents were identified, which include First Nations, the Alberta provincial government, industry, environmental non-government

organizations, the scientific community, and watershed organizations. The focus group was integral in the identification of other participants familiar with CEAM in the Athabasca watershed through the *snowballing* technique. *Snowballing* is valuable technique as it allows for key informants to be identified by asking the initial participants who they considered to be other possible key participants in the Athabasca watershed (Valentine 2005).

Conducting interviews with a wide-range of stakeholders was essential in gaining a clear perspective of how institutional arrangements currently exist in the Athabasca watershed. Although not all respondents were directly involved in the implementation of CEAM initiatives in the watershed, all were knowledgeable of the practice of CEAM and were, in some manner, involved in the overall process of how CEAM is currently being conducted in the watershed or province.

A total of 30 interviews were conducted with key informants in June and July of 2010 (Table 3.1). A total of 52 potential respondents were contacted throughout the interview phase of the research. The 22 potential respondents that did not participate in an interview either did not respond to the initial request for an interview or were unable to participate for different reasons, such as not having time available in their schedules or conflict of interest. All potential interview participants were contacted in advance and invited to participate in the research project by email and/or telephone correspondence. Convenient interview times were scheduled for those respondents that had agreed to participate. Additionally, those who had agreed to participate were emailed a document summarizing the research and its significance along with a participant consent form.

Of the 30 interviews conducted, 6 were conducted in person and 24 were conducted over the telephone. The majority of interviews were conducted via telephone to permit ease of coordination and travel time saving due to the extensive spatial scale of the Athabasca watershed. Advantages of telephone interviews include lower cost and convenience for interviewers (Sturges and Hanrahan 2004; Chadwick *et al.* 1984; Li 1981). The remoteness of telephone interviews are also considered to be advantageous due to the removal of a potential source of bias which may be introduced through face-to-face communication (Bryman 2004). Telephone interviews are noted as having the potential to be as effective as face-to-face interviews (Sturges and Hanrahan 2004). All face-to-face interviews were conducted in the office of the respondent being interviewed. Interview times ranged between 15 and 60 minutes.

Table 3.1 Number of respondents who were interviewed according to their participant group

Participant Group	**Number of Respondents**
Environmental Non-government Organizations	2
First Nations	4
Industry	6
Provincial Government	10
Scientific Community	4
Watershed Organizations	4
Total Interviews	**30**

3.1.3.2 Interview schedule

The interview schedule was developed based upon the results from the previous phase of the larger research project, referred to in Chapter 1 (see Sheelanere 2010). The interviews focused on eight topics, or requisites, previously identified as requirements for advancing watershed-based CEAM. These include:

- Lead agency
- Enabling legislation
- Financial and human resources
- Data management and coordination
- Multi-scaled monitoring
- CEAM baselines, indicators and thresholds
- Multi-stakeholder collaboration
- Vertical and horizontal linkages

Each participant was asked 20 questions, which were divided according to the eight topics. A list of the specific questions is found in Appendix A. Along with the specific questions, probe questions were asked to provide the interviewee with an opportunity to elaborate on specific issues. Probe questions are a valuable tool when conducting semi-structured interviews as they "encourage the respondent to think more deeply about an issue or to expand or explain a preliminary response" (Chadwick *et al.* 1984).

3.2 Data analysis

All interviews were digitally voice-recorded and then transcribed verbatim. The transcribed responses were coded using pre-determined themes. Coding is the first stage in the interview data analysis process and is the basis for classifying material into themes, issues, or topics (Burns 2000). Additionally, coding is beneficial for a systematic analysis of qualitative data that have been collected (Chadwick *et al.* 1984). Coding of the interview data according to the eight requisites required for CEAM was completed through the use of the software program NVivio 9 ©. This software program assisted in managing the large amount of text and efficiently categorizing it into various themes. The focus of the overall data analysis was to delineate the variance and/or commonality of the perceptions held by those interviewed. The data analysis provided a synopsis of how the

respondents perceived the institutional arrangements and related capacity issues of CEAM in the Athabasca watershed.

CHAPTER 4

RESULTS

4.1 Introduction

This chapter presents the results of the semi-structured interviews and document reviews. Results are presented according to the eight requisites required for CEAM, as outlined in Chapter 1. Each of the eight requisites is reviewed individually according to the questions asked of the participants. Results of a final question posed to each respondent at the end of the interview, which allowed the participants to add any additional information pertaining to barriers and bridges relating to CEAM in the Athabasca watershed in Alberta, are incorporated under the specific themes to which they related.

4.2 Lead agency

The presence of a lead agency is an essential element for the assessment of cumulative effects and is necessary for the coordination and communication of information required for CEAM (Parker and Cocklin 1993). Interview questions focused on how participants perceived the lead agency in the watershed. The first question posed related to the presence of a lead agency or institutional structure in the watershed or province mandated to coordinate development activities.

All 30 participants responded to this question. Many participants referred to more than one agency or institutional structure in the province. It was clear from the responses that the lead agency responsible is either the provincial government in general or a branch or ministry of the Government of Alberta. Table 4.1 summarizes the responses given by those interviewed.

Table 4.1 Lead agency or institutional structure mandated to coordinate development activities in the watershed

Lead Agency or Institutional structure	Number of responses	Group Affiliation*
Alberta Environment	22	Gov: 9; Ind: 5; WO: 3; FN: 2; ENGO: 2; SC: 1
Alberta Land-use Framework	4	Gov: 3; SC: 1
Sustainable Resource Development	4	Gov: 2; SC: 1; Ind: 1
Alberta Land Stewardship Act	3	Gov: 2; SC: 1
Land-use Secretariat	3	Gov: 2; FN: 1
Water for Life Strategy	3	WO: 2; Gov: 1
Department of Fisheries and Oceans	2	FN: 1; SC: 1
Lower Athabasca Regional Plan	2	Gov: 2
Alberta Government	1	SC: 1
Canadian Environmental Assessment Agency	1	Ind: 1
Energy Resources Conservation Board	1	Gov: 1
Environment Canada	1	SC: 1
Environmental Enhancement and Protection Act	1	Gov: 1
Water Act	1	Gov: 1
Watershed Planning and Advisory Council	1	Gov: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

The many agencies and institutional structures referred to by the respondents indicated that there may be many different bodies or structures responsible for mandating development at the watershed scale. In spite of this, 22 of the 30 respondents cited Alberta Environment (AENV), revealing that the majority of the respondents considered this body to be the lead agency in the watershed.

In contrast to those who identified a lead agency in the region, seven respondents stated that there was presently no lead agency mandated to coordinate development

activities at the watershed scale. When asked about the presence of a lead agency, one First Nations respondent replied:

> "The jurisdiction is split under the Public Lands Act, the Land Stewardship Act, the Oilsands Conservation Act and the Environmental Enhancement and Protection Act, that's at the provincial level, and then there are other aspects which are federal in nature. For example Fisheries, Aboriginal Rights and so on, and so there is no one agency that has the ability to deal with all the various aspects that are involved."

Likewise, another interviewee from the scientific community responded:

> "In terms of the entire watershed there is not one overarching authority. […] One of the challenges that we face in Alberta is that probably the two lead agencies when it comes to watershed management are Alberta Environment and Alberta Sustainable Resource Development. So Alberta Environment clearly has the responsibility for managing water and Sustainable Resource Development has the responsibility for managing land."

Those who stated that there was not a lead agency present in the watershed were then asked if there was anything that approximates a lead agency. One respondent from the industrial sector noted that the "Land-use Framework […] is going to have a mandate that includes providing guidance on development activities and cumulative effects within […] the Athabasca watershed."

The respondents who identified a lead agency were also asked a follow-up question pertaining to the lead agency's capacity to undertake CEAM. Most respondents focused upon one aspect of capacity (eg. financial, technical or human resources), while others responded to the overall capacity of the provincial government. Although some participants chose not to answer this question, five (two from the scientific community, one from industry, one from First Nations and one from a watershed organization) had

stated that the provincial government does have adequate capacity to mange developmental activities on a watershed scale.

In contrast to those who noted that AENV has the capacity to manage watershed activities, ten respondents (three First Nations, two industry, two watershed organizations, and one from each an environmental non-government organization [ENGO], government, and the scientific community) stated that the provincial government did not have adequate capacity. It was noted by one respondent from the scientific community that "They [the provincial government] have the mandate, but in terms of funding and personnel and time they are constrained in all three respects."

Capacity issues relating specifically to financial resources were identified by several respondents as being a key issue. Moreover, government cutbacks were cited as a factor which has inhibited the provincial government from actively pursuing CEAM initiatives. One First Nations respondent stated that "I'm aware in the last Alberta's budget that they did cut a lot of the monitoring capacity within the Alberta government, which totally doesn't make sense, especially if the tar-sands industry has been ramping up in the past 10-15 years." In addition to this, it was noted by one provincial government representative that "our department has been cutting back on monitoring just because of financial constraints, so that's very limited right now." These responses highlight the fact that a lack of financial capacity may inhibit the effective implementation of watershed-based CEAM initiatives in the Athabasca watershed in Alberta.

In addition to the lack of financial resources, several respondents identified a lack of human capacity within the provincial government. A respondent from the industrial sector mentioned that "I do not believe that they [AENV] have the internal resources to

handle the amount of work." Another First Nations representative noted that "they [AENV] don't have staff, even the human resources, to review effectively natural resource applications that are before them for their approval; for example, a water license." Additionally, one respondent from an ENGO replied that "I would say right now that frankly they're [AENV] stretched, […] they are resource challenged as far as staffing." In addition to the financial and human resources present in the Athabasca watershed to support CEAM, it was also necessary to investigate the theme of legislation.

4.3 Enabling legislation

The presence of enabling legislation is noted in the literature as an important component of watershed management (Ivey *et al.* 2006a). Additionally, improvements in policy and legislation are often viewed as solutions to problems which exist in the management of water resources in Canada (Shrubsole 1990). Each participant was asked two questions relating to enabling legislation in the Athabasca watershed to support CEAM. The first question related to the presence of legislation or policy-based support for CEAM initiatives at the watershed scale.

Several respondents chose not to answer this question due to their stated lack of knowledge relating to CEAM legislation. However, many of those that did answer this question cited more than one piece of legislation, regulation, or policy. The most highly cited guiding articles were *Alberta Land Stewardship Act* (ALSA) and the *Land-use Framework* (LUF). Table 4.2 summarizes the responses.

Several respondents highlighted the importance of ALSA and how this act is linked to LUF. Additionally, it was mentioned that ALSA is currently the overarching piece of

legislation which attempts to integrate the various aspects of legislation, policy, and initiatives. A representative from the Alberta government explained that:

> "The Land-use Framework is supposed to address a lot of impacts from a cumulative effects perspective, from a land base, and eventually make connections to the watershed and […] in order for this Land-use Framework to work they've actually created another piece of legislation called the Alberta Land Stewardship Act, which is an attempt to try to align all of the other different pieces of legislation to make other existing legislation either work or be modified in order to fit this overall Land-use Framework plan or strategy."

Table 4.2 Legislation, regulations or policy to support CEAM

Legislation, regulations, or policy-based support for CEAM initiatives	**Number of responses**	**Group Affiliation***
Alberta Land Stewardship Act	12	Gov: 7; ENGO: 1; FN: 1; Ind: 1; SC: 1; WO: 1
Alberta Land-use Framework	11	Gov: 6; Ind: 2; ENGO: 1; SC:1; WO: 1
Environmental Protection and Enhancement Act	5	FN: 2; Ind: 2; WO:1
Water for Life Strategy	4	Gov: 3; WO: 1
Alberta Water Act	4	Gov: 3; FN: 1
Canadian Council of Ministries of the Environment Drinking water guidelines	4	Gov: 1; Ind: 1; SC: 1; WO:1
Lower Athabasca Regional Plan	4	FN: 1; Gov: 1; SC:1; WO:1
Alberta Water Quality Guidelines	2	ENGO: ; WO: 1
Canada's Fisheries Act	1	SC:1
Canadian Environmental Assessment Act	1	FN: 1
Oil Sands Conservation Act	1	Ind: 1
Canada Water Act	1	Ind: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

Another respondent representing a watershed organization provided a comparable comment, noting:

> "The Land-use Framework, which is supported by new legislation, called the Alberta Land Stewardship Act […] is supposed to deal with cumulative effects in

> Alberta, to look at watershed level cumulative effects and create regional plans that will take those into consideration."

In reference to ALSA and its importance in the management of cumulative effects in the Athabasca watershed, one representative from an ENGO pointed out that:

> "The bottom line is that the Act, and the plans that are generated through that Act at the regional level, will supersede everything. It will supersede all other legislation regarding land use and water in the province, so its pretty serious stuff."

It was evident through the review of documents of current policies and legislation relating to CEAM in Alberta that ALSA is a recent piece of legislation and will be at the forefront of decision-making surrounding land-use planning in the province. A government respondent noted, in reference to the new legislation being developed in the province, that "we're learning as we're going". Additionally, another respondent from a watershed organization demonstrated a sense of uncertainty regarding ALSA and how it presently is unfolding in the province by noting:

> "The Land Stewardship Act will give the power to the Cabinet, not the legislatures, so Cabinet will make all decisions to do with land use, and that includes water. So, that has just passed in the last little while and we don't know how that's going to look in the end."

Another respondent from government similarly mentioned that:

> "I guess, again, a lot of this stuff is in flux right now in Alberta because we are moving to this new regime. We are looking at the Land-use Framework and we're looking at cumulative effects management under the umbrella of the Land-use Framework."

These responses demonstrate that the province is currently in the state of working out what measures must be taken in order to develop concrete CEAM initiatives in the Athabasca watershed and the province.

In addition to the presence of legislation, it was important to consider how these articles may be realized at the project level. This was the purpose of the second question in this section pertaining to enabling legislation, which asked participants if there is a means to ensure that the results of watershed-based programs are implemented at the individual project level.

Table 4.3 Participant responses relating to watershed-based programs implemented at the project-level

Watershed-based programs implemented	**Number of responses**	**Group Affiliation***
No	11	Gov: 4; ENGO: 2; WO: 2; FN:1; Ind: 1; SC: 1
Yes	11	Gov: 7; Ind: 3; WO: 1
Do not know	6	FN: 3; SC: 2; Ind: 1
In the process of developing the means	2	Ind: 1; WO: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

Responses to this question are provided in Table 4.3. Eleven participants responded negatively to the question by noting that presently there is no means of ensuring that the results of watershed-based programs are implemented at the project level. Two respondents noted that the means to ensure that individual projects were consistent with watershed-based programs were in the process of being developed through the Watershed Planning and Advisory Council (WPAC). One representative from a watershed organization stated that:

> "I think in the long term aspect we are certainly looking at that from the WPAC perspective, […] at this point this Watershed Council [Athabasca Watershed Council] is very young, so we would be looking at doing that definitely, but at this point we have a few bricks to build in the foundation."

Eleven interviewees responded positively, noting that the means to ensure watershed-based programs are implemented at the project level is through project approvals and licenses. One government respondent mentioned that "the easiest way to ensure that it's [watershed-based programs] implemented is at the project level, through the conditions in an approval or a license." Similarly, another interviewee from industry noted that "Certainly if they are approval requirements, then yes they are implemented, because that would be a legal requirement for the project." In addition to the recognition of approvals and licenses as being a means to ensure the implementation of watershed-based programs, respondents also highlighted the importance of compliance. One government representative stated that "If they [project proponents] are out of compliance, we take them to court, and they could face penalties, very stiff ones. The Water Act and EPEA [Environmental Protection and Enhancement Act] allow for fines of a million dollars a day per incident." All in all, the ability of the provincial government to take legal action demonstrates that there may exist a means to ensure the results of watershed-based programs are implemented at the individual project level.

4.4 Financial and human resources

The first question asked to the participants under this requisite was related to presence of sufficient resources (e.g. financial and/ or human resources) to support watershed-based CEAM. Several respondents chose to comment generally on the current state of resources in the watershed. Five interviewees felt that overall there were enough resources to

sustain CEAM initiatives. Additionally, two respondents felt that there were insufficient resources. Two respondents chose not to answer the question while all others either responded specifically to financial or human resources or commented on both types of resources.

Those who commented on the current state of financial resources in the Athabasca watershed were clearly divided. Nine respondents, from various participant groups, stated that financial resources did not presently exist in the watershed. In reference to the availability of financial resources for CEAM, one respondent from the industrial sector noted:

> "No, no there isn't. However, if we were to take all the funds that are currently being expended in EIAs, that money would go a long ways to building a system that would do a much better job of actually answering these questions."

Two of the respondents (one from the scientific community and one from government) felt there were inadequate financial resources had commented on the need for adjustments to be made in the funding model which presently exists in the province. It was noted by the representative from the scientific community that "its not just the money, it's the funding model of Alberta Environment or the provincial government in general, they cannot commit money easily for more than one year."

In contrast to those that felt that there were inadequate financial resources, 11 interviewees representing all correspondent groups, with the exception of the ENGOs, stated that presently there were enough financial resources in the watershed to initiate and sustain the types of broad scale and long term initiatives required to support watershed-based CEAM. Of these 11 responses, nine commented on the importance of industry

providing financial resources to support CEAM initiatives. A government representative noted that the "Athabasca has a variety of large industrial players who contribute significantly to the overall research that goes on […] so those resources seem to be fairly consistent, like the dollars seem to always be available for that type of work." Likewise, another government respondent mentioned:

> "I think the potential is there, I think through CEMA [Cumulative Environmental Management Association], RAMP [Regional Aquatics Monitoring Program], WBEA [Wood Buffalo Environmental Association], there has been a lot of industry funding brought to bear on a scale that far exceeds what government would have been capable of providing for those areas over the past 10 or more years."

Although both financial and human resources are required for CEAM, it was noted by several respondents that these two resources are not mutually exclusive and that there is a link between them. It was noted by one respondent from industry that "if you have the financial [resources] the human piece can usually be obtained." Similarly, an interviewee from the scientific community responded that "the funding that's provided to the organization, either to WPAC or to RAMP or to CEMA, as an example, […] allows them to bring people on to manage programs and to get the work done." A third respondent from government simply commented "Money can buy you people."

Respondents who commented specifically on human resources were divided in their responses. Of the 13 respondents who commented, eight felt that there were not presently enough human resources in the watershed to advance and sustain CEAM initiatives. There was no group affiliation among those who had commented. One academic from the scientific community who felt the province lacked in human resources required for CEAM, suggested that in order to improve human resources, the province must "Increase university training." The same respondent also noted that "I am not

producing nearly as many graduate students, me or other researchers, as the province requires." In response to the presence of human resources, a government representative similarly responded "This is always a struggle, expertise and human resources. The point is we need more people for data management." Another respondent representing an ENGO, also commented that cumulative effects initiatives may be inhibited by a lack of people devoted specifically to the assessment and management of cumulative effects. This respondent noted:

> "There's a lot of people who participate in CEMA who also have full time jobs and, as far as people resources, its pretty hard for them to be tasked with such a hard job when they already have so many other things to worry about within their own job capacity. So I think that, that's definitely a challenge."

Five respondents did feel there are currently enough human resources to pursue CEAM programs. One government respondent stated "there certainly is a huge amount of volunteer contribution to watershed planning through the WPACs." Another interview participant noted "I think the human resources are sufficient, the real issue is the political will to facilitate cross-ministerial communication and coming up with consistent objectives." Although this respondent felt that human resources do exist, the need for more coordination within the province was deemed necessary to initiate and sustain watershed-based CEAM. The appropriate allocation of both financial and human resources was identified as a necessary component of CEAM, but several respondents also commented on the need for a better allocation of these resources.

Of those respondents who generally agreed that the resources did exist in the watershed to pursue CEAM initiatives, five indicated that there were issues surrounding the allocation of resources. For example, one government respondent noted that "the

resources exist, the technology exists, the people exist, it's a question of, I think, decision-makers on all fronts, allocating those resources to that end, to the achievement of that outcome [CEAM]." Likewise, another interviewee from the scientific community remarked that "It depends on how you allocate your resources. In the big picture, yeah, there's enough resources; are they currently being allocated? Probably not." Although the resources may exist, these five participants noted that resources might not currently be allocated in a manner that is conducive to watershed-based CEAM.

4.5 Data management and coordination

Monitoring and data management relating to watershed activities is an essential component required to initiate and sustain CEAM initiatives. Squires *et al*. (2010) emphasize the importance of incorporating data which spans broadly over temporal and spatial scales in order to develop frameworks which may support the assessment and management of cumulative effects. Interviewees were asked two questions relating to data management and coordination. The first question concerned the accessibility of the data collected to all stakeholders in the watershed. Responses demonstrated that there was not a general consensus regarding the accessibility of data to all stakeholders. Table 4.4 provides a summary of the responses given.

Eleven of the respondents from different groups commented that presently the data collected in the watershed is not accessible to all stakeholders. One First Nations respondent stated that "There are data, but they're not in an accessible format." Also, another respondent from industry noted, in reference to CEAM initiatives, that open access to data "is probably the single biggest challenge."

Table 4.4 Participant responses relating to data accessibility

Data accessibility to stakeholders	**Number of responses**	**Group Affiliation***
No	11	FN: 3; Ind: 3; Gov: 2; SC: 2; Ind: 1
Some yes and some no	9	WO: 3; Gov: 2; SC: 2; ENGO: 1; Ind: 1
Yes	6	Gov: 3; Ind: 2; FN: 1
In the process of developing access	3	Gov: 2; Ind: 1
Did not know	1	Gov: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

Contrary to those that did not feel that there was open access to data, six respondents perceived data to be accessible to all stakeholders. For example, one respondent from government noted "water quality data are accessible, […and…] are available to the public or to proponents if they wish." In reference to data collected at the EIA stage as part of the Water Act and EPEA approval, another respondent from government noted this information "is reported to Alberta Environment and these reports are available to the public."

Nine interviewees felt that some data was accessible to all stakeholders, while other data were not. It was noted by one respondent from the scientific community that "the answer depends; for some variables, yes and readily so and you find it readily on the web or you can request it, and other pieces of data just aren't available." Likewise, another respondent noted "some data are accessible, some data may not be accessible, not because of policy reasons but because of practical reasons of getting it entered into databases." Of those who felt some data were accessible and that other data were not,

three respondents commented on the accessibility of ground water data. One interviewee from the scientific community stated:

> "Alberta Environment does a good job of providing information, at least in my view, for surface water and other literature that is available online. With respect to ground water, the answer is no, it does not exist. There is no readily accessible database."

Similarly, another respondent from an ENGO commented:

> "Some of that information is available, such as flow data and that type of thing, which I think is fairly available for most watersheds across Alberta, but as far as that specific region [the Athabasca watershed], […] there could be a lot more that could be publically available, especially with regards to groundwater quality."

Nine respondents referred to the importance of the proprietary nature of some data in the Athabasca watershed and how this plays an important role in who may access this data. A government respondent noted "Some of the spatial data is considered proprietary, so it's not readily available." In addition, a First Nations representative had stated:

> "If you're not a member of the Regional Aquatics Monitoring Program, and likely if you're not an oil company or a First Nation, you are likely not a member of the organization, so you won't be able to access any of that data, and that's been a problem for many people, scientists included, who are concerned about water quality and quantity issues."

Two respondents had mentioned that data being collected in the watershed are in the process of becoming accessible to all stakeholders. For example, a representative from the provincial government had stated "we are committed to making it [data] far more accessible than it is currently, […] we are in the process of making consistent province-wide information access portals." This comment alludes to a lack of a central information system in the province which may be accessed by all stakeholders.

Five respondents commented on the lack of a central depository where data may be

housed and disseminated to watershed stakeholders. One respondent from industry stated "there's no central depository for information that people have quick and easy access to. I know of some people working on that issue, but it's a challenge." Similarly, another respondent from industry articulated that information collected in the watershed "needs to be put into regional data sets so that everybody is not recreating the wheel again." An additional comment made by a participant from industry that "there is information available that has not yet been put into a comprehensive database, so there are bits and pieces floating around." A representative from the government asserted that bringing data to a website where it is accessible to all stakeholders is "the missing step."

Online databases or portals were pointed out as being an essential element to the management and coordination of data required for CEAM. Ten respondents commented on data systems or portals which exist or are being developed currently. One interviewee from government stated "There is work being done on, what they're calling, oil sands portals to make various kinds of information more accessible." Another respondent from the provincial government referred to the *Alberta Environment Water Portal*, which may be used to look up different information relating to water quality. Similarly, a respondent from industry stated:

> "The University of Athabasca, they have a project under way that they've staffed and funded where they're looking for just about anything on the Athabasca River that's been written, recorded, photo copied, whatever, and they are trying to, first off, create an index and I think the ultimate goal for them is to create a library in a central location. It would be a library for the Athabasca River that would be indexed and searchable."

Responses relating to data management systems, such as web-based information portals, demonstrate that there are considerations being taken in the province and watershed to

collect and disseminate information which is required for CEAM initiatives. The next question asked related to whether technical capacity existed for data capture, management, and sharing in Athabasca watershed. The responses provided are presented in table 4.5.

Table 4.5 Participant responses relating to the adequacy of the technical capacity for data capture, management, and sharing

Presence of technical capacity	**Number of responses**	**Group Affiliation***
No	12	Gov: 4; ENGO: 2; FN: 2; SC: 2; WO: 2
Yes	11	Ind: 4; FN: 2; Gov: 2; SC:2; WO: 1
In the process of developing	5	Gov: 3; Ind: 1; WO: 1
Did not know	2	Gov: 1; Ind: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

Of the respondents who perceived there to be inadequate technical capacity for data capture, management, and sharing, one government respondent stated "currently Alberta Environment doesn't have the capacity to house data, the huge amounts of data, and even some of the software required to make it accessible to the public through portals." Similarly, another interviewee from a watershed organization mentioned "there is definitely lots of information out there, but no one seems to have the capacity to put it together in an overarching framework." Referring to monitoring specifically, it was noted that "there could be a lot more monitoring stations, especially for surface water along the Athabasca, especially upstream and directly downstream from development." In addition, one respondent from government noted that there is "Huge room for improvement, especially on the groundwater side. Getting groundwater information is very expensive."

In contrast, 11 respondents indicated there was adequate technical capacity for data capture, management, and sharing in the Athabasca watershed. Although several respondents felt there was the technical capacity, they did comment on the lack of other elements relating to capacity which are required for the effective management of data. For example, one respondent from the industrial sector noted "Yeah it [technical capacity] exists, it's just a matter of […] coordinating all the right people in it." Another respondent from government noted there was a lack of resources paid into data management and mentioned:

> "So its not […] as if its [information] being held and people are prevented from accessing it, its just the fact that it ends up in all kinds of different places and doesn't get put in a place or an organized fashion in a way that's easily accessible or available to a large number of people or to the public at large."

Similarly, another respondent representing the provincial government stated, "I would say yes we do, but the resources dedicated to it are meager compared to what's really required to do cumulative effects assessment and management." Another interviewee from government replied:

> "There's adequate technical capacity. There's not adequate […] funds I would say, to put it shortly as possible. I mean those people with that kind of technical expertise have a high billing rate and so they are utilized by corporations for the most part."

Another respondent from First Nations mentioned "I think collectively yes. But everybody's in their stovepipes, right? So I don't think information is being shared."

Several participants raised concerns about the quality of the data being collected. One respondent from the scientific community noted, "a good amount of it probably hasn't been through any kind of good quality control, quality assurance procedure, which

should be done before it's released." Likewise, another respondent from a watershed organization commented that "I think the other big challenge is that […] there is a lot of information about northern Alberta, some is good science and some is not so good science." Results suggest that there may be issues surrounding the quality of the data being collected and required to support CEAM.

4.6 Multi-scaled monitoring

Monitoring is essential to the understanding and management of cumulative effects, and should be done at both the project and watershed scale. Furthermore, monitoring is an important element of CEAM as it provides a means by which watershed parameters may be measured against desired benchmarks. The first interview question focused on whether monitoring is a requirement and whether it is being done for project developments (Table 4.6).

Table 4.6 Participant responses relating to monitoring requirements for project developments

Monitoring as a requirement	**Number of responses**	**Group Affiliation***
Yes	26	Gov: 7; Ind: 6; FN: 4; SC: 4; WO: 3; ENGO: 2
Not certain	4	Gov: 3; WO: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

The majority reported that monitoring is a requirement for project developments. One respondent noted "It's very much required as part of the EIA process. The approval of a project is based on the fact that there will be requirements for monitoring and the monitoring requirements are stipulated."

Table 4.7 Participant responses relating to monitoring being practiced

Monitoring being practiced	Number of responses	Group Affiliation*
Yes	23	Gov: 7; Ind: 6; SC: 4; WO: 3; FN: 2; ENGO:1
Not certain	6	Gov: 3; ENGO: 1; FN: 1; WO: 1
No	1	FN: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

Results from the second part of this question, relating to whether monitoring is actually being done, are presented in Table 4.7. Three respondents noted that monitoring is a legal requirement, which must be met the project proponent. Of these three respondents, one from industry mentioned "Monitoring is a requirement, it is being done by the proponent. It's also in their legal interest, I mean, they don't want to be in non-compliance."

In contrast one First Nations interviewee responded negatively to the question, noting "I don't believe that monitoring is being done for every aspect that's being considered in an EIA." The remaining six respondents did not know if monitoring was actually being done. For example, one participant from an ENGO stated:

> "It's hard to say because a lot of that information remains proprietary. Not a lot of that information is actually publically available, so it's really hard for people to obtain it and it's hard to see what's being done specifically."

The second question posed focused on monitoring programs occurring at the broader watershed scale. There was a general consensus among the respondents that broader watershed scale monitoring initiatives did exist. Positive responses were given by 25 respondents, four negative responses were given, and one interviewee chose not to answer the question. Of those who stated there were monitoring programs operating at the watershed scale, eight had referred to RAMP, four respondents had mentioned

CEMA, and three respondents had noted the presence of both RAMP and CEMA as being responsible for broader watershed scale monitoring.

A follow-up question posed to those who answered positively asked whether both landscape and aquatic monitoring were taken into account in the broader watershed scale monitoring programs. The 25 respondents who were asked this question varied in their responses (Table 4.8). Eight respondents noted that 'landscape' is not included within aquatic monitoring programs at the watershed scale. For example, one respondent from the scientific community asserted that:

> "The problems with watershed people is they think that watersheds have something to do with water and that's a big problem. The quality and the quantity of the water is not a function of the water, it's a function of the landscapes through which it travels."

Another interviewee from a watershed organization noted that "I think that is what the hope is for these regional watershed plans that are being developed by Alberta Environment under the Water for Life strategy." Three participants noted that some monitoring programs take into consideration both landscape and aquatics, while other programs do not. One respondent from industry noted that:

> "Some do, some don't. There's more and more recognition that land use and landscape has a direct impact on water quality. So in other words, people are recognizing that if you are going to manage the main stream, you are going to have to mange the watershed."

Five positive responses were provided for this question. Of these, one interviewee referred to the Alberta Biodiversity Monitoring Institute "which looks at various aspects of biodiversity monitoring, terrestrial, some aquatic, lots of plants and animals, insects etcetera." Another respondent from government indicated that the province was in the

process of developing monitoring programs which include both landscape and aquatic monitoring, noting that "this will be addressed under the Lower Athabasca Regional Plan."

Table 4.8 Participant responses relating to watershed scale monitoring programs which include landscape and aquatic monitoring

Watershed scale monitoring which include landscape and Aquatics	**Number of responses**	**Group Affiliation***
No	8	Gov: 2; Ind: 2; SC: 2; FN: 1; WO: 1
Did not know	6	Gov: 4; Ind: 1; SC: 1
Yes	5	Gov: 2; FN: 1; Ind: 1; SC: 1
Some yes and some no	3	Gov: 1; Ind: 1; WO: 1
No response given	2	ENGO: 1; Ind: 1
In the process of developing	1	Gov: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

4.7 CEAM baselines, indicators and thresholds

The presence of baseline data, indicators and thresholds for CEAM is essential when attempting to understand the scientific aspects of cumulative effects. These parameters are also required for CEAM monitoring programs. The results of this section have been generated through a series of four questions. The first question asked under this requisite related to the presence of a formal and accessible data set, such as a state of the watershed report (Table 4.9).

Twelve respondents did not perceive there to be a formal and accessible data set available for the Athabasca watershed. One respondent from a watershed organization commented on the baseline data and indicated that "building these baselines that can be shared and utilized for ongoing impact assessment takes lots of money, takes lots of time

and hasn't been done well in the past. So, it's definitely the hugest challenge to the watershed councils." In a similar manner, a respondent from an ENGO referred to baseline data by noting:

> "I think there have been some reports, but the problem is that none of those reports existed before development started taking place. So, as far as a true baseline, a predevelopment baseline, I am not aware of any of those such reports for the things that they are and should be monitoring right now."

Nine respondents noted that a state of the watershed report was in the process of being developed. One government representative mentioned that "There is no single report or database right now, but there will be once the Athabasca Watershed Council gets their state of the watershed done." In contrast, six participants felt that there was a formal and accessible data set in the watershed. One government respondent mentioned that "I think there are some pretty good resources specific to the Athabasca. It received a lot of attention, largely for quality aspects in the Northern River Basin Study and the Northern Rivers Ecosystem Initiative."

Table 4.9 Participant responses relating to the presence of a formal and accessible data set

Presence of accessible data set	**Number of responses**	**Group Affiliation***
No	12	FN: 3; Ind: 3; ENGO: 2; Gov: 2; WO: 2
In progress	9	Ind: 3; Gov: 2; SC: 2; FN:1; WO: 1
Yes	6	Gov: 5; WO: 1
Do not know	2	SC: 2
No comment given	1	Gov: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

The second question posed to the interviewees related to the presence of common science-based indicators which exist in the watershed (Table 4.10). One respondent from industry, who perceived that core indicators are currently in the process of being developed, noted that "there is a process that we have to go through to identify what the key indicators are going to be for the Athabasca and that's part of our State of the Watershed, is trying to identify those indicators." Similarly, another respondent from an ENGO asserted that:

> "One of the initiatives that Alberta Environment has taken recently is, they've started the process of developing a suite of core indicators of watershed health and the intent of that, the obvious, is to have a consistent suite of core indicators, but another component of that process is to try and get some consistency across the board as to how those indicators are measured."

Table 4.10 Participant responses relating to the presence of common science-based indicators

Presence of science-based indicators	**Number of responses**	**Group Affiliation***
No	10	FN: 3; Ind: 3; SC: 2; Gov: 1; WO: 1
Yes	9	Gov: 5; ENGO: 1; Ind: 1; SC: 1; WO: 1
In progress	8	Gov: 3; WO: 2; ENGO: 1; Ind:1; SC: 1
No direct answer provided	2	FN: 1; Gov: 1
Do not know	1	Ind: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

The next question related to standard monitoring indicators and whether these indicators are present across project EIAs (Table 4.11). The majority who responded perceived that there were standard monitoring indicators or requirements. Of those who stated that there were not standard monitoring indicators across project EIA, one government participant noted that "I think that would be kind of a foolish thing to do,

because the EIA is established based on the particulars of a project and the impacts it might have."

Table 4.11 Participant responses relating to the presence of standard monitoring indicators

Presence of standard monitoring indicators	**Number of responses**	**Group Affiliation***
Yes	16	Gov: 5; FN: 3; Ind: 3; SC: 2; WO: 2; ENGO: 1
Do not know	7	Gov: 3; WO: 2; FN: 1; SC: 1
No	3	Gov: 1; ENGO: 1; Ind: 1
No direct response	2	FN: 1; Ind: 1
Yes and no	1	SC: 1
Chose not to answer	1	Gov: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

The last question in this section pertained to the presence of thresholds for development in the Athabasca watershed (Table 4.12). Ten respondents felt that there were not thresholds established for water quality parameters and ten respondents felt that there were indeed thresholds present in the Athabasca watershed. One interviewee from government affirmed that:

> "there's work being done that's in progress around identifying targets and thresholds related to surface water, but that's all in progress through the work of management frameworks and the regional plan. So it hasn't […] been formalized."

Another respondent from a watershed organization similarly pointed out that "It's very hard to put one number or one parameter to say that's the threshold, but the goal is to work toward those thresholds and establish those thresholds per watershed, but it is not an easy task." Several participants referred to the Council of Ministers of the Environment (CCME) guidelines and/or the Alberta water quality guidelines, as

mechanisms for directing the maximum allowable effects levels in the Athabasca watershed.

Table 4.12 Participant responses relating to thresholds for development

Presence of thresholds for development	**Number of responses**	**Group Affiliation***
No	10	Ind: 4; SC: 2; WO: 2; ENGO: 1; FN: 1
Yes	10	Gov: 4; FN: 2; ENGO: 1; Ind: 1; SC: 1; WO: 1
In progress	7	Gov: 6; WO: 1
Do not know	2	FN: 1; Ind: 1
Yes and no	1	SC: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

4.8 Multi-stakeholder collaboration

Watershed-based CEAM requires that various stakeholders be incorporated into the decision-making framework. The integration of multiple stakeholders is an important element of CEAM, as it provides a means by which cumulative management solutions may be integrated into the decision-making process (Canter and Ross 2010; Therivel and Ross 2007). Interview questions focused on the multi-stakeholder organizations and mechanisms in the Athabasca watershed, and the definition of the roles of the stakeholders participating in CEAM initiatives. The first of the two questions related to the presence of mechanisms or organizations for facilitating multi-stakeholder collaboration in the watershed (Table 4.13).

Many of the respondents had referred to more than one mechanism or forum present in the Athabasca watershed which allows for the incorporation of multiple stakeholders in the decision-making processes relating to CEAM. The two most highly

cited organizations were the Athabasca WPAC and CEMA. Four participants pointed out that the Athabasca WPAC lacks decision-making power due to it only being advisory in nature. One respondent from industry noted, "They are not a regulatory agency, they don't have decision-making power, but they can make recommendations to government."

Table 4.13 Participant responses identifying multi-stakeholder forums or mechanisms

Multi-stakeholder forums or mechanisms identified	Number of responses	Group Affiliation*
Watershed Planning and Advisory Council (WPAC)	16	Gov: 6; WO: 3; ENGO:2; FN: 2; SC: 2; Ind: 1
Cumulative Environmental Management Association (CEMA)	14	Gov: 5; Ind: 3; ENGO: 2; SC: 2; FN: 1; WO: 1
Water for Life	5	Gov: 1; ENGO: 1; Ind: 1; SC: 1; WO: 1
Athabasca Watershed Council	4	Gov: 3; WO: 1
Wood Buffalo Environmental Association (WBEA)	3	Gov: 1; FN: 1; Ind: 1
Alberta Water Council	2	ENGO: 1; Ind: 1
Lesser Slave Watershed Council	2	Gov: 2
Regional Aquatics Monitoring Program (RAMP)	2	FN: 1; SC: 1
Keepers of the Athabasca River	1	FN: 1
Canadian Oilsands Network for Research And Development (CONRAD)	1	FN: 1
Environmental Protection and Enhancement Act (EPEA)	1	Gov: 1
Lower Athabasca Regional Plan (LARP)	1	Gov: 1
Lakeland Industry & Community Association (LICA)	1	Gov: 1
Watershed stewardship groups	1	ENGO: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

Despite that the WPAC may lack decision-making authority, four interviewees commented that the Athabasca WPAC is presently the best multi-stakeholder forum in the watershed. For example, one government respondent noted that "it's a very new

organization, but very determined and has a lot of will there to move the health of the watershed forward, creating a forum for idea sharing, for innovation, for development of further knowledge." Likewise, it was noted by a representative from a watershed organization that:

> "I think down the road it's really also up to the WPACs to work very hard to establish the linkages, the relationships throughout the watershed with all players, all sectors, and to encourage the debate regarding cumulative effects and how we are actually going to deal with this and to get everybody on board."

Three respondents commented on CEMA and how the present structure of this organization may not be conducive to multi-stakeholder collaboration. One interviewee from government stated that "I do understand that some members of CEMA had left the organization, they had problems, I think, with the organizational structure and its decision making model." Also, another participant from the scientific community noted that "at least two of the big First Nations groups have quit." A further comment was made by a representative from the Alberta government:

> "That's where a consensus seeking group, like CEMA, has had a lot of difficulty. It's all formed with the best of intentions and everybody with a stake did participate in the beginning, as time went on, some views and positions started to get more entrenched and it wasn't proving to be a very good vehicle for taking entrenched positions and so some groups pulled out and that weakens the whole purpose of the group."

Two respondents provided comments relating to the Water for Life Strategy as a means to pursue multi-stakeholder initiatives relating to the management of cumulative effects in the Athabasca watershed in Alberta. One government representative affirmed that:

> "Water for Life, that is a very widely supported policy. And […] from a bureaucrat's perspective, it does present some challenges to get going and maintain. But as long as the public's support is there, it's not going to go away, it's going to

> improve […]. I would say the Athabasca River, does it benefit from public involvement? Big time, big time."

The second question focused on the roles and responsibilities of watershed stakeholders and whether they are clearly defined (Table 4.14). Responses demonstrate a lack of consensus on the definition of the roles of the various stakeholders in terms of decision-making about development, managing impacts to the watershed, and water use. Twelve participants felt that the roles of stakeholders were defined, and 11 respondents perceived the roles not to be clearly defined. Of those who responded negatively to the question, one member of an ENGO asserted that:

> "I would probably say that they are not well defined enough, especially with some of the land use planning that's going into effect right now. It seems a little bit unclear about who's regulating what within the oil sands and the specific duties of multi-stakeholder groups and whether or not they have any legislative power to be able to put in place what they are actually doing and putting so much time and money into."

A government respondent also noted that "Right now for the WPACs they have been asking for a little clarity about their role and some of our staff working with them don't have a clear understanding of exactly what the WPACs are supposed to do."

Four respondents stated that the roles were clearly defined in some areas but not in others. Two others felt that the roles were in the process of being defined. One respondent in this category from government stated:

> "I think that they are going to become more defined. […] And that's where we get to maybe some of the tricky part, because there is a lot of different regulators, there's a lot of different authority organizations who are involved in making decisions or involved in how the watershed is impacted, […] probably right at the Alberta Environment role there is a bit of fuzziness [as] to how much responsibility the other organizations have to actually carry out specific things."

Overall, there were mixed perceptions about how the roles of stakeholders in the watershed are presently defined.

Table 4.14 Participant responses regarding the definition of stakeholder roles

Stakeholder roles clearly defined	Number of responses	Group Affiliation*
Yes	12	Gov: 5; Ind: 3; SC: 2; WO: 2
No	11	FN: 3; ENGO: 2; Ind: 2; SC:2; Gov: 1; WO: 1
Yes and no	4	Gov: 3; Ind: 1
In progress of being defined	2	Gov: 1; WO: 1
No direct response provided	1	FN: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

4.9 Vertical and horizontal linkages

Under this requisite interview participants were asked three questions relating to linkages between watershed-based and project-based CEAM initiatives. The first question asked whether project-based EIAs are guided by other regional or watershed-scale plans and policies (Table 4.15).

The results demonstrate that there was not consensus among the interviewees, although 13 of the 30 participants did respond positively to the question. One of these participants from government stated "once a plan or framework is put in place or is even actively being worked on, there is awareness shown of that in the EIAs that are done for new projects." An additional respondent from government mentioned that "a good example would be [that an] EIA coming into […] the Athabasca oil sands would be framed within the context of the land management plan or the Integrated Resource and Management Plan that is in place."

Table 4.15 Participant responses regarding project-based EIAs being guided by regional or watershed-scale plans and policies

Project EIAs guided by broader initiatives	**Number of responses**	**Group Affiliation***
Yes	13	Gov: 7; Ind: 3; SC: 2; WO: 1
No	9	FN: 3; ENGO: 2; Ind: 2; SC:1; WO: 1
In progress of being developed	6	Gov: 2; WO: 2; Ind: 1
Chose not to answer	1	FN: 1
No direct response provided	1	SC: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

In contrast, nine participants replied that project EIAs are not guided by other regional or watershed-scale plans and policies. One interviewee from the scientific community commented that "EIAs are nothing more than a means to get a rubber stamp to get your project approved. They are dealt with in isolation of other projects." It was also noted that EIAs are "all very narrow and isolated." In a similar manner, another participant from an ENGO asserted that:

> "EIAs are very project-based and the EIAs are only required to really put what their specific impact of their specific project is going to be and that's one of our complaints is often that it doesn't put things into a regional context."

Lastly, six participants perceived that project-based EIAs are in the process of being guided by other regional or watershed-scale plans and policies. For example, one respondent from government noted that:

> "Well they [EIAs] are guided by the policies we have in place. Our government is moving towards what we call cumulative effects management, where it is more place-based rather that project-by-project based assessment. So it will look at the bigger picture when doing project assessments."

Another respondent from industry made a general comment stating that "I think in Canada we've gone about it the wrong way. We have started at the project level and moved upwards, when perhaps we should have started at the planning level and moved downwards."

The second question asked related to the results of project-based EIAs and monitoring programs being used to support broader watershed initiatives (Table 4.16). One representative from the provincial government, who answered positively to the question, noted that:

> "absolutely, because in EIAs we have a lot of information related to lithology, geology, hydrology, groundwater quality, this is a huge amount of information that is used to not only process applications, but also in regional groundwater framework developments. This was the base for us to assess the current status of groundwater in the entire watershed."

Another respondent from government commented: "Yes, but not as much as they should be. There's lots of data, but little awareness of its existence." Of the seven participants who responded negatively to this question, one had affirmed that "Unfortunately, the EIA data doesn't generally get used for much beyond the EIA."

Table 4.16 Participant responses regarding project-based EIAs being used to support broader watershed initiatives

Project EIAs used to support watershed initiatives	**Number of responses**	**Group Affiliation***
Yes	9	Gov: 7; Ind: 2
Do not know	7	ENGO: 2; FN: 1; Gov: 1; Ind: 1; SC:1; WO: 1
No	7	FN: 2; SC: 2; WO: 2; Ind: 1
Chose not to answer	3	FN: 1; Gov: 1; Ind: 1
In progress of being developed	2	Ind: 1; SC: 1
No direct response provided	2	Gov: 1; WO:1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

The third question asked in this section related to land use and water policy plans and programs and whether they are consistent with broader watershed-scale plans (Table 4.17). Of the 30 participants, ten felt that land use and water policy plans and programs were in the process of becoming consistent with broader watershed-scale plans.

Table 4.17 Participant responses regarding land use plans being consistent with broader watershed-scale plans

Land use plans consistent with watershed plans	**Number of responses**	**Group Affiliation***
In progress of being developed	10	Gov: 4; Ind: 2; WO: 2; ENGO:1 FN: 1
No	9	Ind: 3; FN: 2; WO: 2; Gov: 1; SC: 1
Do not know	4	SC: 2; FN: 1; Ind: 1
Yes	4	Gov: 4
No direct response provided	3	Gov: 1; ENGO: 1; SC: 1

*Abbreviations used: Government (Gov); Environmental Non-governmental Organizations (ENGO); First Nations (FN); Industry (Ind); Scientific Community (SC); Watershed Organization (WO).

A participant from the Government of Alberta stated that:

> "one of the actions right now within the department, or within the government generally, is to try to align some of these pieces of legislation so that there is a more synergistic effort to ensure the overall watershed management is being looked after."

In addition, another respondent from a watershed organization similarly noted that:

> "Well again, we're at a really early stage in Alberta on that. We have the big Land-use Framework planning process going on and definitely we are trying to make sure that watershed plans are integrated into that land use planning process."

Beyond the responses given to the specific question, it was interesting to find that nine respondents cited the Land-use Framework. For example, one participant from an ENGO noted that "the whole integration between the regional Land-use Framework plans and

the watershed-based plans is being developed as we go." Six participants had mentioned the present lack of a broader watershed plan for the entire Athabasca watershed. One interviewee from a watershed organization mentioned that "I think you need to have a watershed management plan in the first place. We don't have one yet." Further, one respondent from industry stated that "in Alberta they don't really have strictly watershed-based plans, at least for the Athabasca they've divided it into two watersheds." Additionally, two comments were made which acknowledged the size of the Athabasca watershed as being a formidable challenge in the pursuit of developing broader watershed-scale plans. One participant from industry affirmed that:

> "The biggest one [challenge] is probably the size of the basin, it's very large and has a number of different geographic regions along the river, certainly a number of economic regions along the river and trying to pull that together is going to be a challenge and that's what the WPAC is trying to do at the moment."

The above results demonstrate, like the first two questions, a general lack of consensus regarding the themes presented. In spite of this, several additional comments provided by the participants relating to this question revealed broader perspectives of the present state of watershed-scale plans in the region.

CHAPTER 5

DISCUSSION

5.1 Introduction

This chapter analyzes data for each of the eight previously identified requisites necessary for watershed-based CEAM and provides a discussion of the results. An evaluation of the presence of the requisites and related capacity issues is conducted.

5.2 Lead agency

The presence of a lead agency has been identified as a key requisite for implementing and sustaining CEAM initiatives (see Sheelanere 2010). Interview responses demonstrated general agreement that the Alberta provincial government was the agency responsible for mandating and coordinating watershed-based development activities in the Athabasca watershed. Identification of the provincial government as the lead agency is aligned with the literature that recognizes that watershed-based CEAM must be led by governments (Seitz *et al.* 2011; Kennett 1999; Griffiths *et al.* 1998). Specifically, the majority of those interviewed identified Alberta Environment (AENV) as the lead agency. In spite of there being a lead agency present in the Athabasca watershed, there were concerns raised about the capacity of the provincial government to function as a lead agency, particularly in relation to financial and human resources.

In the absence of adequate financial and human capacity, the efficacy of a lead agency may be compromised. Results demonstrate that many respondents felt that the provincial government was presently lacking the financial resources required to pursue watershed-based initiatives. It was noted by several participants that government

'cutbacks' have been a cause for the lack of funding required by agencies responsible for developing and sustaining CEAM initiatives.

Human resources are also an essential element of capacity required by a lead agency. It was pointed out in the interviews that there is a link between financial and human resources; and if financial capacity is lacking, so too may be the human capacity. The results reveal that many participants perceived a lack of human resources, such as expertise, which is required for CEAM initiatives. This is supported by the literature, which highlights that there is currently a lack of CEAM expertise in government agencies (Canter and Ross 2010). Some respondents did feel that the human element of capacity, relating to the lead agency, may be enhanced through the incorporation of the various stakeholder groups into the overall decision-making framework. While the provincial government may augment its human capacity through watershed-based agencies, there is no evidence that this is happening.

Since CEAM initiatives have only recently been legislated in Alberta, the government is presently in the process of understanding precisely what resources are required to establish an effective lead agency. Although the presence of a lead agency directed by government has been noted as an essential component for watershed-based CEAM (Seitz *et al.* 2011; Kennett 1999; Griffiths *et al.* 1998), there presently lacks literature which focuses on the resources which are required to enhance the capacity of a government lead agency. Additionally, further considerations must be taken toward investigating the types of funding mechanisms which are required to build the financial and human capacity of Alberta Environment as the lead agency in the Athabasca watershed. The overall lack of commitment by key decision-makers toward CEAM has

been noted as a reason why adequate funding mechanisms have not yet been developed (Canter and Ross 2010).

5.3 Enabling legislation

While myriad legislation were cited, participant responses focused on two specific articles which have been developed to support CEAM; those being the Land-use Framework (LUF) and the Alberta Land Stewardship Act (ALSA). These two pieces of legislation were pointed out by several participants as being related to one another, and together act as the dominant plan to support watershed-based CEAM in the Athabasca watershed. Although the presence of these articles demonstrates that indeed there is legislation present in the province to guide CEAM, there were some concerns expressed.

One of the specific concerns regarding these articles of legislation was that both LUF and ALSA are very recent initiatives mandated by the province and have not had adequate time to be incorporated into watershed management frameworks. In spite of this, it has been mentioned that the establishment of new legislation may act as a means of achieving institutional adaptation in the implementation of water management strategies (Cortner and Moote 1994). Although these new articles of legislation had been identified by respondents, some expressed that there is uncertainty relating to how these articles will actually be implemented in the province. This reveals that LUF and ALSA may require a period of gestation before conclusions may be made regarding their overall efficacy. It has been noted in the literature that there presently exists a lack of clear field tested processes for watershed-based CEAM (Dubè *et al.* 2007); however, the presence of these new articles of legislation may provide a unique opportunity to observe how overarching CEAM initiatives may be implemented. Therefore, it may be too

presumptuous to derive any sound deductions regarding how this legislation may support watershed-based CEAM in the Athabasca watershed.

In addition to the presence of specific legislation, participants had also provided their perspectives on whether there was a means to ensure that the results of watershed-based programs are implemented at the individual project level. It was highlighted by a number of respondents that the principle mechanism in the province and watershed to ensure watershed programs are implemented is proponent licenses and approvals. It was noted that proponents are legally bound to comply with the requirements set out by their licenses and/or approvals and these requirements are often related to broader watershed-scale initiatives and programs. The references made to licenses and approvals may suggest that indeed there does exist a means to ensure watershed-based programs are implemented at the project level. Additionally, these responses may reveal that the province possesses legal capacity to ensure that projects are aligned with watershed scale initiatives. The legal capacity is manifested in the fact that the province is able to pursue litigation measures if the proponent is not in compliance with their license or project approval.

5.4 Financial and human resources

Financial and human resources are required for the general implementation of watershed-based CEAM initiatives. The interview data revealed that there was not a general consensus regarding the adequacy of financial and human resources available in the Athabasca watershed to initiate and sustain watershed-based CEAM. Many participants were of the opinion that the financial and human resources necessary for CEAM were present, while others held starkly contrasting views. As a result of the variance in

perceptions, it cannot be concluded whether these resources are indeed present in the watershed.

Although a general conclusion cannot be drawn from the participant responses regarding the presence of adequate financial and human resources, there were many related concerns expressed by participants. It was noted that the current problem regarding financial resources in the Athabasca watershed is a result of the funding model currently employed by the provincial government. These comments provided by participants are aligned with the literature which notes that the development and maintenance of regional frameworks requires suitable funding and cost-sharing agreements (CEAA 2000). The novel state of CEAM initiatives in the province may be a reason that an appropriate funding mechanism to support and sustain watershed-based CEAM has not yet been developed. Several participants did note that there are significant financial resources in the watershed as a result of the fast-paced industrial development, especially in the oil and gas sector. A government-funding model which allocates these resources in support of watershed-based initiatives may benefit the development of CEAM programs. A financial framework which guarantees funding beyond a single term of government may ensure that financial resources will be available for on-going CEAM initiatives.

In reference to financial resources, participants noted inefficiency in the present system, where large sums of monies are spent on EIAs, which are not used for any purpose beyond acquiring project approval. It was noted that if financial resources were used toward broader initiatives, as opposed to site-specific EIAs, then the financial resources may be available to support CEAM programs.

The general conclusion that can be drawn from the results is that if funding is available for CEAM initiatives, then the human resource component may be obtained. The knowledge and expertise required to pursue CEAM were noted to be present in the watershed and province; however, the financial capacity necessary to mobilize this knowledge and expertise for CEAM is lacking within the government.

5.5 Data management and coordination

Participant responses relating to the availability and management of data demonstrated varying perceptions. It was noted by some respondents that there is a need for data management frameworks, such as online databases, which may be accessed by all stakeholders. These databases would provide information both water quality and quantity data in addition to land use data in the Athabasca watershed. These comments are aligned with the literature which notes the importance of having internet databases to provide regional data that may assist in the development and sustaining of CEAM programs (Canter and Ross 2010; Braat 2002). In spite of this, many references were made to portals or data management frameworks which presently exist or are in the process of being developed. Although there was reference to data management programs in the Athabasca watershed, many concerns had surfaced regarding the lack of access to data in the watershed.

Several government officials were certain that information was available to all stakeholders through AENV; however, this was not the general sentiment of participants outside of government. There were concerns expressed regarding the proprietary nature of much of the data and the deficiency of open access to this information. These concerns are highlighted in the literature which notes that the lack of access to data may inhibit

CEAM (Piper 2000). This may suggest the presence of proprietary ownership on data as a barrier to the sharing and transfer of knowledge among stakeholders.

Additionally, the undisclosed data held by private organizations may reveal a need for data sharing agreements to be made with the provincial government. This may promote an effective data management system which could be accessed by all stakeholders. Although data may be present in the watershed and province, there appears to be a lack of prevailing capacity to share and disseminate data among stakeholders in the Athabasca watershed. In spite of this, the Government of Alberta has proposed directives, under the LUF, to create an integrated information system that ensures decision-makers have access to the information required for CEAM (Alberta Environment 2008).

Several respondents also voiced concerns regarding the lack of strict quality guidelines for the collection and dissemination of data. These concerns are supported by the literature, which notes that relevant scientific information is often highly fragmented across stakeholder groups (Allen and Kilvington 2005). A lack of consistency in the quality of data being collected may pose a barrier to effective CEAM. Participants also noted a lack of technical capacity, such as deficiencies in monitoring stations. A lack of monitoring stations may be due to a lack of funding provided by both the provincial and federal governments. Although monitoring initiatives are in place through industry-funded groups, such as RAMP, it was demonstrated in the interviews that the integrity of such an organization may be questioned due to a lack of government oversight.

It was pointed out by several participants that data management and coordination initiatives are in the process of being developed under the auspices of government

legislation, such as the LUF and ALSA. These articles were noted as being an important step in the implementation and sustaining of watershed-based CEAM. It was suggested that the presence of these government initiatives might assist in developing the ability to manage and coordinate data to support the assessment of cumulative effects at the watershed-scale.

5.6 Multi-scaled monitoring

Participants generally agreed that monitoring is a requirement of project level developments. It was noted that proponents are legally required to partake in monitoring, as indicated in their project approvals. However, there were concerns regarding how the data being collected is presently being used. It was suggested that the monitoring information collected, as required by project licenses or approvals, may not be used to support broader watershed initiatives. Again, much of this information remains proprietary and may not be readily available. Most respondents were in agreement that monitoring is being done at the watershed scale. Many respondents had cited either the Regional Aquatics Monitoring Program (RAMP) or the Cumulative Environmental Management Association (CEMA) as the organizations which are at the forefront of broader watershed monitoring. However, some participants did emphasize concerns regarding the efficacy of these organizations. These concerns have also been demonstrated in the literature, which notes that monitoring programs should be improved to ensure consistency in data collection to facilitate broad scale assessment (Squires *et al.* 2010).

Despite the general agreement relating to project-based monitoring in the Athabasca watershed in Alberta, there was a lack of consensus regarding the linkages

between landscape and aquatic monitoring occurring at the watershed-scale. The responses provided by participants demonstrated a wide sense of uncertainty regarding the integration of landscape and aquatic monitoring. The integration of landscape and aquatic monitoring at the watershed level is in the process of being developed under the LUF and ASLA.

5.7 CEAM baselines, indicators and thresholds

There was variation in responses regarding the presence of a formal and accessible data set, which provides baseline data for water quality, quantity and usage. But, many of the participants indicated that a State of the Watershed Report for the Athabasca watershed in Alberta is in the process of being developed. It was noted that the creation of a State of the Watershed Report is the responsibility of the Athabasca Watershed Planning and Advisory Council (WPAC) and has been one of its main objectives since its inception in 2010. This is consistent with the mandate set by the Government of Alberta which highlights that the Athabasca WPAC is set to begin developing a State of the Watershed report in 2010-2011 (Government of Alberta 2010). Such State of the Watershed reports have been composed in other watersheds in the province, such as the Bow River Basin Council which completed its first State of the Watershed Report in 1994 and a second one in 2005 (see BRBC 2011).

There was also variation in responses relating to the presence of science-based indicators for assessing the cumulative effects on the landscape or to water resources at the watershed scale. Many respondents had mentioned that baselines, indicators and thresholds are in the process of being developed. This is consistent with the objectives of ALSA relating to regional plans, which states that this Act is to "describe or specify the

monitoring required of thresholds, indicators and policies" (Province of Alberta 2009: 8[2][d]).

The majority of those interviewed felt that there were standard monitoring indicators or requirements across project EIAs. This may reveal that the ability to initiate CEAM may be present, as there are common indicators which may be compared across the watershed. However, there was variance in the participants' perceptions relating to the presence of thresholds for development in the watershed. Despite the variation in responses, it was noted by participants that the province is in the process of developing thresholds through the current initiatives of the Government of Alberta. This is consistent with the objectives outlined by the province under ASLA and the LUF, which are mandated to identify targets and thresholds in the pursuit of cumulative effects management in the region (Alberta Environment 2008).

5.8 Multi-stakeholder collaboration

Interview responses revealed that participants generally perceived there to be mechanisms or forums in place to support multi-stakeholder involvement in decision-making about watershed development. The two organizations, which were largely cited as being conducive to multi-stakeholder inclusion in the watershed, were the Athabasca WPAC and CEMA. In addition to these organizations, the Water for Life Strategy in Alberta was noted as providing a general framework for the incorporation of multiple stakeholders in broader watershed management. The identification of these mechanisms demonstrates that multi-stakeholder collaboration does presently exist in the Athabasca watershed in Alberta. These institutions are essential in forming a foundation upon which watershed-scale CEAM initiatives may be based. The presence of these multi-

stakeholder mechanisms counters the literature which notes that there is currently no indication that multi-stakeholder collaboration is being utilized in the pursuit of CEAM initiatives (Canter and Ross 2010).

In spite of these programs, there were many concerns expressed by participants regarding the capacity of these multi-stakeholder groups in the watershed. For instance, several participants were critical of RAMP for being funded by industry and noted that the incorporation of the views of stakeholders outside of industry, such as ENGOs and First Nations groups, are excluded. The limited inclusion of stakeholders in RAMP counters the suggestion made in the literature which highlights the need for a framework that satisfies both developers and other stakeholders (Piper 2000). The participant concerns relating to the lack of inclusion of all stakeholder groups may also be a result of an asymmetry in power distribution. It has been noted that local stakeholders may find it difficult to have their interests recognized *vis-à-vis* the interests of other stakeholders where power asymmetry exists (Adger *et al.* 2003). The asymmetry in power distribution among these multi-stakeholder institutions poses a challenge to the advancing of organizational capacity, as there is not equal input by all stakeholders into the decision-making processes.

Respondents had additionally mentioned that some groups, which were initially members of CEMA, had withdrawn their membership from this organization. This demonstrates that there may presently exist challenges to meet the objectives of CEMA which aim to promote cooperation and information sharing between stakeholders in the Lower Athabasca region (see CEMA 2010). These responses are consistent with the literature which notes that CEMA has not yet been successful in meeting its goals relating

to this organization's multi-stakeholder and consensus-seeking approach (Hegmann and Yarranton 2011).

Participants had also noted that there exist difficulties in the funding model of the Athabasca WPAC. There were concerns emphasized regarding the lack of financial resources, provided by the provincial government to support this organization. This may demonstrate a strain on the organizational capacity of the WPAC due to financial constraints.

The interview responses revealed variations relating to the clarity of the roles of stakeholders in terms of managing impacts to the watershed and in making decisions about development. This lack of clarity in the definition of roles may hinder the effective inclusion of stakeholders into the decision-making frameworks relating to CEAM; as many groups involved are not aware of their specific functions and responsibilities. It was noted by several respondents that the roles and responsibilities are in the process of being clarified through the recently implemented LUF and ALSA. This may suggest that the decision-making capacity of stakeholders participating in watershed-based initiatives may be in the process of being augmented through the clarification of the roles and responsibilities. However, at the present time, the efficacy of these institutions may be hampered by a lack of clarity in stakeholder roles and responsibilities.

5.9 Vertical and horizontal linkages

It has been identified in the literature that project-based initiatives should be linked with broader regional and watershed-based programs to develop an understanding of the sources of cumulative environmental change (Harriman and Noble 2008; Duinker and Greig 2006; Kennett 2002). Participant responses, however, demonstrated a lack of

consensus regarding the presence of linkages between watershed-based initiatives and project-level developments. It was noted by some participants that EIAs, which provide the framework for project-specific developments, act solely as a means for project proponents to gain approval. This idea has been identified in the literature as an inhibiting factor of CEAM (Seitz *et al.* 2011; Duinker and Greig 2006).

Some participants perceived that EIAs are not used for broader regional planning. In contrast, others perceived the linkages between project and broader watershed developments to be in the process of being initiated through provincial schemes, such as the LUF. This is noted as being an effective means in which to pursue CEAM (see Dubé and Munkittrick 2001). This may suggest that there is currently a shift away from project-by-project assessment toward broader watershed-based and regional programs in Alberta.

There was also division in the participant responses relating to land use and water policy programs being consistent with broader watershed-scale plans. It was mentioned by respondents that there is a lack of broader watershed plans in the province. This is reiterated by the provincial government which has acknowledged that Alberta does not currently have formal regional planning (Alberta Environment 2008). The lack of broader watershed initiatives in the Athabasca watershed may reveal a lack of capacity to link land use and broader watershed-scale plans. In spite of this, it was noted in the responses that the province is currently in the process of integrating watershed plans with land use planning. These comments are supported by the mandates of the LUF which aims to ensure that planning for land use is aligned with water quality objectives through regional level planning (Alberta Environment 2008). The introduction and enactment of legislation required to support the implementation of the Land-use Framework was

introduced in Spring 2009 (see Pembina institute 2009).

It was noted by participants that the ability to coordinate watershed-based initiatives might further be inhibited by the spatially extensive scale of the watershed. The spatial scale of the Athabasca watershed is noted as a factor which should be considered when attempting to assess cumulative effects (Seitz *et al.* 2011).

5.10 Discussion summary

Although participant responses did demonstrate a sense of agreement on several themes, it is clear that there exists a great deal of variation among perceptions relating to CEAM. This chapter has analyzed each of the eight previously identified requisites necessary for the assessment of cumulative effects and has provided a synopsis of the presence of these requisites and the capacity-related issues. Table 5.1 summarizes the key findings from this research project.

Table 5.1 Key findings of this research project

CEAM requisite	Key Findings
Lead agency	• Alberta Environment is the lead agency in the watershed mandated to coordinate developmental activities and promote CEAM initiatives • The presence of a lead agency in the watershed provides a basis from which institutional arranges may coordinated in the Athabasca watershed
Enabling legislation	• There exists legislation in the province mandated to support CEAM initiatives, primarily the LUF and ALSA • Due to the novelty of these articles of legislation, it is too early to discern how the legislation will support CEAM initiatives • The legislation may provide future guidance as to how institutions in the watershed are to be arranged and how the various elements of capacity may be augmented

CEAM requisite	Key Findings
Financial resources	• There are many financial resources present in the Athabasca watershed, largely due to the contributions from industry, which demonstrates that financial resources do exist • In spite of the presence of financial resources, there is a lack effective funding mechanisms to support CEAM initiatives
Data management and coordination	• Although there do exist initiatives in the watershed to collect and disseminate data needed for CEAM, there are issues surrounding the accessibility and quality of the data being collected • There is a deficiency in the overall capacity to collect and disseminate data to all watershed stakeholders
Multi-scaled monitoring	• Monitoring is required by project proponents in the watershed and is being completed as part of their project approvals or licenses • There are concerns regarding the lack of monitoring initiatives occurring at the broader watershed scale • Effective watershed-scale monitoring requires further institutional coordination within the Athabasca watershed, such as between government and the private sector
CEAM baselines, indicators and thresholds	• A common set of baseline data, indicators and thresholds is being developed under the auspices of the provincial government through LUF and ALSA
Multi-stakeholder collaboration	• Many frameworks are presently in place in the Athabasca watershed which are conducive to multi-stakeholder involvement (eg. CEMA, RAMP, and the Athabasca WPAC) • There are capacity issues relating to the overall efficacy of these groups, such as a lack financial models and the inclusion of all stakeholders in the watershed • The presence of multi-stakeholder groups demonstrates that the organizational capacity for CEAM initiatives is being developed
Vertical and horizontal linkages	• There is a lack of coordination between project-level developments and broader regional plans and programs required to support watershed-based CEAM • The overall capacity to align project and regional plans is in the process of being developed through recent legislation

CHAPTER 6

CONCLUSION

6.1 Research contributions

The primary objective of this research was to gain an understanding of the institutional arrangements and related capacity required to support the assessment and management of cumulative effects in the Athabasca watershed in Alberta. It is well justified that there is a pressing need to understand institutional requirements for CEAM at the watershed-scale (e.g. Harriman and Noble 2008; Duinker and Grieg 2006). In response to this deficiency in understanding, this research identified the institutions which are present in the Athabasca watershed relevant to CEAM and provided an analysis of the capacity needs relating to these institutions. Overall, this research provided an investigation of how CEAM may be advanced in the Athabasca watershed by focusing on capacity building and institutional arrangements. Specifically, this research placed emphasis on the various institutions which exist, such as watershed agencies, government and industry, and the processes and structures of decision-making, including policy, legislation, and key stakeholders.

In addition to providing insight relating to CEAM specifically in the Athabasca watershed, this research also contributes to a better understanding of the current challenges faced by other regions in Canada relating to CEAM. As such, this study will contribute to the final objective of the larger project of which this research is part, and assist in combining the lessons learned in the Athabasca watershed with other Canadian watersheds. These lessons will assist in advancing the knowledge and understanding of

the institutional arrangements and capacity needs required to support watershed-based CEAM.

6.2 Lessons learned

This research revealed several important lessons regarding the capacity to support CEAM in the Athabasca watershed in Alberta. First, the results demonstrate a general lack of agreement relating to the presence of the requisites needed for watershed-based CEAM and reveal a lack of clarity in the overall CEAM process. This is aligned with the literature, which notes that CEAM often lacks clarity and a common language which may be understood by all stakeholders (see Seitz *et al.* 2011; Squires *et al.* 2010; Cormier and Suter 2008; Baxter *et al*. 2001). In spite of this, the Government of Alberta has mandated several initiatives which highlight the importance of CEAM in Alberta. In particular, the Land-Use Framework and the Alberta Land Stewardship Act emphasize the need for CEAM to be included as part of the overall environmental management strategy in the Athabasca watershed and province. Although reference to CEAM is made in the provincial legislation, there is a lack of description within these articles of legislation to provide guidance as to how CEAM may be actually pursued. This leads to a second lesson which has surfaced from this study; in order for CEAM to be actively pursued on a watershed scale, there is a need for legislation to go beyond simply mentioning CEAM and provide clear guidelines as to what must be done to reach the overall objective of CEAM.

It is clear from this research that many supporting institutions required to support CEAM are present in the Athabasca watershed. Such institutions include watershed agencies, monitoring organizations, and government policy and legislation. In spite of the

presence of such institutions, there is an apparent deficiency in the capacity within these institutions. It may be noted that all the necessary institutions for CEAM exist in the Athabasca watershed; however, there still remains a lack of capacity to fit these institutions together in the appropriate manner to support watershed-based CEAM. Again, the capacity to enhance CEAM may be developed in the future through detailed legislation mandated specifically to CEAM.

Another lesson which derives from this research is that collaborative efforts are being made in the Athabasca watershed to support CEAM. This is evident in the multi-stakeholder groups present in the watershed, such as the Athabasca Watershed Planning and Advisory Council (WPAC), the Cumulative Environmental Management Association (CEMA), and the Regional Aquatics Monitoring Program (RAMP). Despite the presence of these groups, this research found that there still exist capacity issues which are inhibiting these groups from functioning optimally. These issues include deficiencies in funding, human resources, or the ability to incorporate the various stakeholders into decision-making processes.

It is evident from this research that initiatives are being pursued in the province of Alberta toward watershed-based environmental management. Specifically, the Land-Use Framework places emphasis on the need to delineate watersheds as the analytical units for environmental management. However, due to novel legislation relating CEAM, it is not possible to deduce whether CEAM will be effectively pursued at the watershed-scale at the present time.

6.3 Recommendations

Although this research has revealed that the Government of Alberta is in the process of advancing the assessment and management of cumulative effects in the Athabasca watershed, it should be acknowledged that more must be done to ensure that an implementation plan for CEAM is developed. The Government of Alberta must make it a priority to create legislation which goes beyond simply mentioning the need for CEAM and provide a clear framework for how CEAM should be implemented in the Athabasca watershed and province. This legislation must clearly indicate how funding is to be procured, who is to be included in the overall decision-making frameworks, and explain the roles and responsibilities of the various stakeholders who are partaking in CEAM initiatives. Furthermore, future CEAM legislation must make reference to data management and coordination and identify how data are to be collected and shared among all stakeholders in the Athabasca watershed.

In addition to the creation of legislation which provides guidance for the implementation of CEAM in the watershed, considerations must be given toward the allocation of the resources which are required to support CEAM initiatives. Although the financial and human capacity required for CEAM exists in the province, measures must be taken to allocate these resources appropriately to provide an effective means by which CEAM initiatives may be pursued. One specific element which will assist in achieving more effective allocation of resources is the development of concrete financial plans and program which guarantee funding beyond a single term of government.

Another recommendation is that a more equitable distribution of decision-making power should be provided to multi-stakeholder organizations in the watershed, such as

the Athabasca WPAC. Measures should be taken to enhance the decision-making capacity of the Athabasca WPAC, which presently only acts as an advisory organization in decision-making processes.

It is also recommended that educational campaigns be developed for practitioners and others involved in CEAM which clearly define objectives and provide guidance as to how cumulative effects are to be assessed and managed. This may allow for those involved in the practice of CEAM to make decisions based upon a common set of objectives and promote dialogue among stakeholders.

Although these recommendations may not entirely resolve the current deficiencies in the practice of CEAM in the Athabasca watershed in Alberta, they will assist in strengthening the overall institutional framework required for the management and assessment of cumulative effects. Additionally, these recommendations will assist other watersheds in Canada in developing institutional arrangements needed for CEAM and assist in providing clarity in the how CEAM initiatives are to be implemented. In spite of this, it is necessary to acknowledge that the assessment and management of cumulative effects will vary from one watershed to another and that practices should be developed to meet the unique challenges of specific watersheds. All in all, it should be recognized that "Cumulative effects management is an emerging practice, an art not a science" (Alberta Environment 2008). Accordingly, CEAM it should be practiced in a manner which recognizes the dynamic and unique characteristics of individual watersheds, and should be practiced according to principles which allow for flexibility in decision-making processes.

6.4 Limitations

Although this research project has been optimistic in contributing to the advancement of CEAM in the Athabasca watershed in Alberta, it must be noted that there are some limitations to this study. First, the expansive scale of the Athabasca watershed posed a challenge to the collection of information from the various stakeholders who may possess valuable data required to support CEAM initiatives. Although 30 interviews were conducted, this is only a small sample of those who are involved in CEAM in the Athabasca watershed. Due to the myriad stakeholder groups in the watershed, all perspectives could not be collected; for instance, all First Nations groups and industrial groups were not contacted due to time and financial constraints. Additionally, this study would have benefited from conducting additional focus group meetings with individuals belonging to the same organization. This would have given individuals within a specific organization an opportunity to deliberate about CEAM and provide a collective response, opposed to an individual response, as to how their organization perceives CEAM in the Athabasca watershed.

Also, the Athabasca watershed is a politically sensitive area due to the oil sands development, which is the center of much debate around water quality and quantity parameters. As such, the contentious nature of watershed planning in the Athabasca watershed in Alberta may have been a deterrent for some key informants to participant in this study. Additionally, the attention given to oil sands development by participants throughout the interviews may have acted to conceal some of the other important activities in the watershed which are adversely affecting water resources.

6.5 Future research

This research aimed to characterize the institutional arrangements of CEAM in the Athabasca watershed in Alberta; however, there is more which may be done to gain insight into how capacity may be enhanced in the Athabasca and other Canadian watersheds. Therefore, a direction for future research is to evaluate the efficacy of the current initiatives mandated under the Government of Alberta to promote and sustain CEAM in the Athabasca watershed. A further direction for research is for a holistic review of the provincial and federal legislation and policy relating to CEAM to be conducted across Canada. Such a review will assist in providing a comparative analysis and will assist in advancing the understanding of the institutional arrangements relating to the assessment and management of cumulative effects across Canada's watersheds.

Future research should also focus upon how CEAM may be advanced in watersheds which cross provincial boundaries. The reason for this is that the pursuit of watershed-based CEAM initiatives may be inhibited due to variance in institutional frameworks in different provinces. This is important to consider in watersheds, such as the Athabasca, where the watershed crosses provincial boundaries. In order for CEAM to be effectively pursued on a watershed scale in such instances, it is necessary that the institutions and related capacity issues be considered on both sides of the border and how the initiatives may be integrated in order to promote efficacy in the pursuit of CEAM. Such studies may investigate the similarities and differences in policy and legislation and attempt to design institutions which may bridge CEAM initiatives between provinces.

Lastly, it may be worthwhile for future research to consider how planning tools, such as collaborative planning, may be beneficial in providing guidance as to how

various stakeholders may be incorporated into the decision-making frameworks relating to CEAM. Such planning models may be beneficial in overcoming some of the difficulties revealed by this study, such as the lack of cooperation and coordination among some stakeholder groups in the watershed.

This research verifies that, indeed, there are limitations in the current understanding of the institutional arrangements related to CEAM and that the current institutional arrangements are not well understood. In spite of this, it has been revealed through this research that the capacity to support CEAM is being developed through the various initiatives which are present in the Athabasca watershed and the Province of Alberta.

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Appendix A: List of interview questions

Lead Agency	Is there a lead agency, ministry, or institutional structure in the watershed or province mandated to coordinate development activities (including monitoring and assessment) at a watershed scale? If **NO**, is there anything that approximates such a structure (perhaps at a sub-watershed scale, in certain economic regions, etc.)? Please explain. Is there adequate capacity? Is there a potential/perceived need to expand? If **YES**, does this organization have the adequate capacity (legal, financial, technical) to coordinate watershed scale programs and initiatives required for WCEA (eg. monitoring, data sharing, coordinate stakeholders, etc)?
Multi-stakeholder collaboration	At the watershed scale, is there a mechanism or forum for facilitating multi-stakeholder collaboration, such as a stakeholder panel, committee, or council, in watershed planning, monitoring, making decisions about development, etc? Are the roles of government, watershed agencies, project developers, and so on clearly defined in terms of managing impacts to the watershed and in making decisions about development in the watershed and water use?
CEAM baselines, indicators and thresholds	Is there a formal and accessible data set (e.g. a state of the watershed report) that provides a baseline on such things as surface and ground water quantity, quality, and usage, as well as on various land uses affecting water resources? Are there common science-based indicators for assessing the cumulative effects on the landscape or to water resources at the watershed scale? Are there standard monitoring indicators or requirements across project EIA?
Multi-scaled monitoring	Is monitoring required in project EIAs or for certain developments? Is it being done? Are there monitoring programs operating at the broader watershed scale? If **YES**, do they include landscape (e.g. land use change/disturbance)

	as well as aquatic monitoring? If **NO,** is the monitoring done for projects (e.g. EIAs) compatible with what is being collected at the watershed scale?
Data management and coordination	For those data that are collected in the watershed, is it accessible to all watershed stakeholders (e.g. project proponents, watershed agencies, etc)? Is there adequate technical capacity for data capture, management, and sharing (For spatial/land use data and for water use/quality data)?
Vertical and horizontal linkages	Are project-based EIAs guided by other regional or watershed-scale plans and policies? Are the results of project-based EIAs and monitoring used in any way to support broader watershed initiatives (e.g. watershed monitoring, planning, etc)? Are other land use and water policy plans and programs consistent with broader watershed-scale plans?
Enabling legislation	Does there exist legislation or any regulatory or policy-based support for CEA initiatives at the watershed scale (e.g. for monitoring, planning, assessment)? Is there any means to ensure that the results of watershed-based programs (e.g. monitoring, planning, assessment) are implemented at the individual project level?
Financial resources	Currently, in this watershed, does there exist sufficient resources to initiate and sustain the types of broad scale and long terms initiatives required to support watershed-based CEA (e.g. financial and/ or human resources for monitoring, coordination, planning, reporting, and so on)?
Supplementary Question	What, in your view, are the most significant barriers and bridges in this watershed to advancing (and sustaining) CEA at the watershed scale?